ARITHMETICK

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Plainest and most Concise METHODS hitherto Extant.

John WITH Pearson

New Improvements

For Dispatch of BUSINESS in all the several

RULES.

Thomas AS ALSO, Pearson

FRACTIONS Vulgar and Decimal, wrought together after a New Method, that renders both easy to be understood in their NATURE and USE.

The whole Perus'd and Approv'd of, by the most eminent Accomptants in the several Offices of the REVENUE, *viz. Customs, Excise, &c.* as the only Book of its Kind, for Variety of RULES and Brevity of WORK.

The FOURTH EDITION, with considerable Additions, and curious Improvements, by the Author,

GEO. FISHER, Accomptant.

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Thomas Reed

1200
5
6000
3000(250

James Simpson 1757

To the Right Worshipful

Sir Samuel Clarke, *Knt.*

And Merch^t of the Honourable

CITY of *LONDON.*

By Sir Samuel Clark

SIR,

WHEN I consider'd of your great Abilities, and most consummate Knowledge, in Things of this Nature, I was under great Hesitations, lest I should appear too Presumptuous in Dedicating such a Trifle to your Worship: But then, Sir, again considering, that your Candor, and obliging Condescention, was equally as great; and also encouraged by Favours formerly received, I have ventur'd to shelter this

Treatise of ARITHMETICK *under your Great Name; and if it gain but your Approbation, I shall not be ambitious of any other* Imprimatur; *but acquiesce with some Assurance, that the Book will meet with a favourable and kind Reception in the World. In this Impression, I have endeavoured to be as Correct as possible, and have made considerable* Additions, *and some curious* Improvements *in the several* Rules; *which, with all humble Submission, encourages me to hope may in Part excuse for my Fourth Presumption of the Troubling your Worship; and remain with all possible Respect and Deference,*

Your Worship's

most Devoted,

and most Obedient

humble Servant,

Isabella Pearson

Sarah Pearson

Amelia Murden

1757

Geo. *Fisher*.

THE PREFACE.

SOmetime before I attempted, or had any Thoughts of compiling this Book, a very good Friend of mine, (Mr. *Wilkins*, *Russia* Merchant) desired me to draw him out some few Notes of the shortest Ways and Methods of working some of the Rules in *Arithmetick*; which when I set about, in endeavouring to oblige my Friend, I hit on several Things, (not thought on by me before) which I hop'd, if made publick, might be of good Service to the World.

If it be objected, That the Books on this Subject are too numerous already, I answer, That as many as there are extant, yet there are none so perfect, but there may be Improvements made upon them; and if so, and that those Improvements

ments may be of any confiderable Ufe and Benefit to Mankind, why may they not be made publick?

Arithmetick (faith Mr. *Locke*, in his *Effay on human Underftanding*) is of fuch *general Ufe and Service*, in all the Parts of Life and Bufinefs, that fcarce any thing is to be done without it; and therefore I think there cannot be too many, or too good Inftructions for its Attainment: And before either *Hodder*'s, *Cocker*'s, or *Ayre*'s Books appear'd in the World, there were many excellent Pieces of that Science then extant; and yet their Books came abroad, and found encouraging Entertainment, and they themfelves Applaufe for their Endeavours.

And if another improves as much upon them, as they did upon others before them, why may he not hope for fome Succefs and Approbation? In fhort, if the Book meets with Encouragement but equal to the Author's Care and Endeavours, to make it the moft ufeful of its Kind, he will have Reward enough.

As to the Work, I have gone thro' *Numeration*, *Addition* (with feveral ufeful Tables) *Subtraction*, *Multiplication*, and *Divifion*, with fo much Plainnefs and Perfpicuity, and in fuch familiar and pertinent Terms, that the meaneft Capacity may underftand them, and apply them properly.

In

In *Multiplication* I have been more copious than ordinary, that I might ſhew the excellent Uſes that may be made of that Rule only, particularly in *Money*; where, by having the Price of one Thing, I have ſhewn how to find out the Value of many Things at that Rate: So that if a Perſon well underſtands the Methods and Intentions of the Rules and Directions therein laid down, (which are as eaſy as *Addition of Money*) if ~~he makes~~ no farther Advances in *Arithmetick*, yet he ſhall be able to caſt up moſt Things that ordinarily occur in common Buſineſs, with Elegancy and Expedition.

In *Diviſion* I have ſhewn the two *Italian* Ways of Dividing; and alſo ſeveral *Examples*, whereby a Sum many times may be ſooner (and in much fewer Figures) work'd at two Diviſions than at one: Likewiſe how Sums of divers Denominations, as of *Pounds*, *Shillings*, and *Pence*, &c. may be divided into equal Parts, without reducing them into the loweſt Name mentioned, (as is generally the Practice) and is done in half the Time, and a quarter of the Figures us'd in the other Way. Alſo by *Diviſion* to find, having the Value of many Things, the Price of one Thing at that Rate.

In *Reduction* I have ſhewn great Variety of Working, and divers Ways of abbreviating the common Method us'd in that Rule; and

and how to bring *Grofs Weight* into *Pounds* without multiplying.

Next I ſhew the ſhorteſt and beſt Methods of deducting *Tare* and *Tret*, &c.

In the *Rule of Three* I have been very full in explaining its Nature and Uſe; with two ſeveral Methods of ſhortening moſt Operations in that Rule, as is clearly evinced by ſundry Examples therein.

From thence I paſs to the *Rule Inverſe*, and exemplify it by Variety of *Rules* and *Examples*: As alſo the *Double Rule of Three Direct*, and *Inverſe*; with the *Rule of Three*, compoſed of the Five given Numbers.

Then the ſeveral *Rules of Practice* are taught, with greater Variety and Improvements than in any one Book of *Arithmetick* hitherto extant.

As alſo the *Rule of Company*, with a Method of contracting the tedious Way of working Queſtions in that Rule.

Likewiſe *Intereſt* at all Rates, ſhewn in ſundry *Examples* variouſly wrought. With *Diſcount*, *Exchange*, *Profit* and *Loſs*.

Then I treat of *Fractions* both *Vulgar* and *Decimal*, working one with the other, in ſuch a Method as render both eaſy to be underſtood, and in ſuch familiar Terms as explain their Nature and Uſe.

I have now with the utmoſt Care, Diligence and Probity, endeavour'd to make this

Piece

Piece of *Arithmetick* the moſt uſeful of its Kind, (conſidering its Bulk and Value) that is at preſent extant: Here is nothing abſtruſe or myſterious, but all plain and eaſy; and nothing but what will bear an intelligible Demonſtration.

I have gone thro' the whole Book, Line by Line, and have taken all due Care to correct what was amiſs in the other Impreſſions; and as there was no other Hand in the Reviſal made uſe of but my own, I can with greater Aſſurance affirm, and with the more Confidence aſſert, that the Book is now intirely correct: And the *Additions*, which are very numerous and conſiderable, (almoſt in every Rule) are new, ſhort, and very conciſe in Operation; and pertinently interſpers'd thro' the whole, as I had Oportunity, and ſaw Occaſion.

If there ſhould, by Chance, be a Tranſpoſition of a Letter, (tho' there hath been great Care taken of that alſo) or by a greater Chance, a falſe Figure, or Cypher, or a miſplac'd one, I hope, nay, I doubt not, but the truly judicious, and candidly ingenious Readers will excuſe me for them; for tho' all may take Care, yet there's none infallible. But I can with a modeſt Boldneſs aſſure them, there is no Occaſion for an *Errata* Page, which may diſcourage them at Beginning, or cool them at the latter End of the Book.

ARITH-

ARITHMETICK,

WITH

NEW IMPROVEMENTS,

In the Plaineſt *and* moſt Conciſe METHODS *hitherto Extant.*

CHAP. I.

ARITHMETICK is the Art of caſting Accompt by Number, and hath theſe Five Parts, *viz.* NUMERATION, ADDITION, SUBTRACTION, MULTIPLICATION, and DIVISION, which ought thoroughly to be known and underſtood; for by theſe Rules only, the whole Art is attainable, all other being wrought by them.

Of NUMERATION.

NUMERATION teaches to read or Write any Sum or Number, known or propos'd.

To which End obſerve, That all Numbers whatſoever, are expreſs'd by, or compoſed of, theſe Ten Figures or Characters, *viz.*

One,	Two,	Three,	Four,	Five,	Six,
1	2	3	4	5	6
Seven,	Eight,	Nine,	Cypher.		
7	8	9	0		

The firſt Nine of theſe are called Significant Figures, to diſtinguiſh them from the 0, or Cypher, which, of it ſelf, is inſignificant, and therefore, by ſome, is called a Nought; but it ſerveth to increaſe, or decreaſe the Value of other Figures, according as it is placed.

Every one of the Nine Digits hath two Values; the one certain, by its Form; the other uncertain, by its Place.

The Value of a Figure may be ſaid to be certain, when it ſtands alone, without any Figure or Cypher annexed to it: Or, if it ſtands in the firſt Place, or Place of Units, in a Number; for then it never ſignifies any more than its own ſimple Value; as 2 is but Two, 6 but Six.

The Value of a Figure may be ſaid to be uncertain, with reſpect to to the Place it is found in: So any of the Nine Figures in the Place of Units, ſignifies but its ſimple Value, (as was ſaid before) but in the ſecond Place it is to be accounted ſo many Tens, as it contains Units. As 5, in the firſt Place, is but Five; but in the ſecond Place it ſignifies ſo many Tens, or Fifty. So that 5 may ſignify Five, or Fifty, or Five Hundred, or Five Thouſand; and 7 may ſignify 7, or Seventy, or Seven Hundred Thouſand, &c.

So

So every Figure is increased in Value, by a Tenfold Proportion, from the Right Hand to the Left. As, in the first Place, it is so many Units, or Ones; in the second Place, so many Tens; in the third Place, so many Hundreds; in the fourth, so many Thousands; in the fifth, so many Ten Thousands; in the sixth, so many Hundred Thousands: in the seventh, so many Millions: &c.

Admit this Number for Explanation, *viz.* 1234567, the 7 is only seven Units, or seven; but the 6 in the second Place, is six times Ten, or Sixty; the 5 in the third Place, an hundred times Five, or five Hundred; and 4 in the fourth Place, a thousand times Four, or four thousand; the 3, three times ten Thousand, or thirty Thousand; the 2, in the sixth Place, two hundred Thousand; and 1, in the seventh Place, one Million. Thus the Order of Places is accounted from the Right Hand to the Left, but to read from the Left Hand to the Right, thus; one Million, two Hundred, thirty four Thousand, five Hundred, Sixty-Seven.

If any Figure hath a Cypher, or Cyphers, joined to it, it will still retain the Value of its Place, as much as if joined with any other Figure, or Figures, in the room of the Cypher, or Cyphers. So if to the Figure 5, there be annexed a Cypher thus (50) its Value is five Tens, or Fifty; because it stands in the second Place, or Place of Tens. Or, if it have two Cyphers joined with it thus, (500) its Value is five Hundred; because it possesseth the Place of Hundreds, or third Place, &c.

For the easier understanding the foregoing Directions, and better reading any Number, observe the following *TABLE*

The Numeration TABLE.

laces	9 Hundreds of Millions.	8 Tens of Millions.	7 Millions.	6 Hundreds of Thousands.	5 Tens of Thousands.	4 Thousands.	3 Hundreds.	2 Tens.	1 Units.
	9	8	7	6	5	4	3	2	1
		9	8	7	6	5	4	3	2
			9	8	7	6	5	4	3
				9	8	7	6	5	4
					9	8	7	6	5
						9	8	7	6
							9	8	7
								9	8
									9

Milli.	Thousand.	Units.
987	654	321
98	765	432
9	876	543
	987	654
	98	765
	9	876
		987
		98
		9

The first thing to be done is to get by heart the Value the several Places, with their Number at the Head of e Table, *viz.* Units, Tens, Hundreds, Thousands, &c. hich being well understood, the Learner may thereby capable of reading or writing any Number propos'd.

And for the easier reading of the Numbers in the Ta-e, they are, on the right hand set by Periods, and er them the Names of Units, Thousands, and Milli-s, and to be read thus; 987 Millions, 654 Thousands, 1. The next Line, 98 Millions, 765 Thousands, 432. d the next, 9 Millions, 876 Thousands, 543, &c.

Though

Though this Table consists but or nine Places, yet it might have been extended to twelve, fourteen, or more Places, at Pleasure. As after Hundreds of Millions, Thousands of Millions, Ten Thousands of Millions, Hundred Thousands of Millions, then Millions of Millions, &c.

As, admit this Number of thirteen Places, *viz.* 1234567890123 ; for the easier reading of which, or any other Number, make a Point under or over every third Figure, begining at the Right Hand, thus,

1 234 567 890 123

So that the first Point is under 1, and the last under 2, towards the left Hand ; and you are to account every third Place, or Period, Hundreds, and to read it thus, 1 Million of Millions, 234 Thousands, 567 Millions, 890 Thousands, 123.

QUESTIONS.

1. *What is 5 in the fifth Place?*

Answ. By annexing four Cyphers on the Right Hand thus, 50000 ; it is Fifty Thousand.

2. *What is 7 in the seventh Place?*

Answ. By putting six Cyphers on the Right Hands thus, 7000000 ; it is Seven Millions.

3. *How do you set down Eleven Thousand, Eleven Hundred, and Eleven.*

Answ. Thus, 12111,	11000 Eleven Thousand.
	1100 Eleven Hundred.
	11 Eleven.
Proved by *Addition.*	12111 *Proof.*

4. *How do you write Fourteen Thousand, Fourteen Hundred, and Fourteen?*

Answ. Thus, 15414 | 14000 Fourteen Thousand
1400 Fourteen Hundred
14 Fourteen

Proved by *Addition.* | 15414 *Proof.*

NUMBERS.

707, Seven Hundred and Seven.
4006, Four Thousand and Six.
60606, Sixty Thousands, Six Hundred and Six.
100004, One Hundred Thousand and Four.
7770405, Seven Millions, 770 Thousands, 405.
500007, Five Hundred Thousands and Seven.
111111, One Hundred and Eleven Thousands, 111.
199999, A Million wanting One.
400400400, Four Hund. Millions, 400 Thousands, 400.
100000000 { Ten Thousand Times Ten Thousand, or, One Hundred Millions. *Revelat.* v. 11.
200000000 { Two Hundred Thousand Thousand or, Two Hundred Millions. *Revel.* ix. 16.
2070040500 { Two Thousand and Seventy Millions, Forty Thousand Five Hundred.

A Table of Old Roman *Numbers.*

100	C.	2000	CIↃ. CIↃ. or, M. M.
200	CC.	3000	CIↃ. CIↃ. CIↃ. or, M. M. M.
300	CCC.	5000	IↃↃ.
400	CCCC.	10000	CCIↃↃ.
500	D. or IↃ.	50000	IↃↃↃ.
600	DC.	100000	CCCIↃↃↃ. or, CM.
700	DCC.	500000	IↃↃↃↃ.
800	DCCC.	1000000	CCCCIↃↃↃↃ.
900	DCCCC.	1666	MDCLXVI.
1000	M. or, CIↃ.	1734	MDCCXXXIV. or, CIↃIↃCCXXXIV.

CHAP.

CHAP. II.

Of ADDITION.

ADDITION is the putting two or more Numbers or Sums together, and thereby bringing them into one total Sum.

And is of one Denomination, or ſeveral.

Addition of one Denomination is, when the Numbers or ſeveral Articles from the Top to the Bottom are all of one Name; that is, all *Pounds*, *Gallons*, *Ells*, *Miles*, *Sheep*, &c.

Addition of ſeveral Denominations is, when the ſeveral Lines conſiſt of divers Names; as *Pounds*, *Shillings*, and *Pence*; *Hundreds*, *Quarters*, and *Pounds*; or, *Yards*, *Quarters*, and *Nails*, &c.

Numbers to be added together, muſt be placed in ſuch Order under one another, (it matters not which is uppermoſt, the greateſt or leaſt Numbers) that Units may ſtand under Units; Tens under Tens, Hundreds under Hundreds; Thouſands under Thouſands, &c.

As if you were to add 120 Foot, 44 Foot, and 34 Foot together, they muſt be ſet down one under the other as follows, *viz.*

Feet		Feet
120	Or thus	34
44		44
34		120

Having placed the Numbers to be added as above, draw a Line under them, and begin at the loweſt Figure on the Right Hand, being the Place of Units, ſaying, 4 and 4 is 8, which put directly under the Line, and juſt under its own Rank, *viz.* under 4 and 4, and 0; and then go to the next Row towards the Left

Hand, ſaying, 3 and 4 is 7, and 2 is 9; which alſo ſet down under the Line, juſt under its own proper Rank, *viz.* under 3, 4, and 2; then go to the laſt Row, where you find but 1, which you muſt put down alſo under the Line juſt under it ſelf; and ſo the Numbers are added together; and you will find that they make 198 Feet in all, as by the *Examples* following.

Hundreds.	Tens.	Units.
1	2	0
	4	4
	3	4
1	9	8

Hundreds.	Tens.	Units.	
	3	4	
	4	4	
1	2	0	
1	9	8	*Feet in all*

When any of the Ranks amount to Ten, or Tens, or that they exceed Ten or Tens, then you muſt put a Cypher (if even Tens) under the Line in its proper Place; or elſe what is above Ten or Tens, and for every Ten carry a Unit, or One, to be added to the next Rank. *As for Example:* If the *Series*, or Row, amount juſt to Ten, I ſet down a Cypher under the Line in its Place, (for every Figure or Cypher muſt be ſure to ſtand juſt under its own Rank) and carry one to the next Rank for the one Ten. So if any of the Rows come juſt to even Tens, as 20, 30, 40, &c. I ſet down a Cypher, and carry either two, three, or four, according to the Number of Tens. And when it happens, that any of the Ranks exceed Ten or Tens, then whatever the Exceſs is, ſet it down under the Line in its Place. As if it amounts to 45, ſet down 5, and carry 4, for the four Tens, to the next Row. If to 72, ſet down 2, and carry 7, for the ſeven Tens, &c. And when you come to the laſt Row, ſet down what it amounts

amounts to, let it be what it will. *Examples* follow, exemplifying the Directions above.

Add 26 *l.* 15 *l.* 20 *l.* and 45 *l.* together. Also 265 Ells, 354 Ells, 460 Ells, 375 Ells, and 246 Ells together; which must be set down as underneath.

Pounds	Ells
26	265
15	354
40	460
45	375
	246
106	1700

Begining at the lowermost Figure in the Place of Units, say, 5 and 5 is 10, and 6 is 16, which is 6 over one Ten, wherefore set down 6 under its own Rank, and carry 1 for the Ten to the next Rank, saying, 1 that you carry and 4 is 5, and 2 is seven, and 1 is 8, and 2 is 10, which being the last Row, set down 10, and the Work is done; and the Total of the four Numbers is 106 *l.* As in the *Example.*

So in the next *Example*, begin with the bottom Figure on the Right Hand, and say, 6 and 5 is 11, and 4 is 15, and 5 is 20; which being just 2 Tens, and nothing over, set down a 0, and carry 2 to the next Rank, for the 2 Tens, and say, 2 that you carry and 4 is 6, and 7 is 13, and 6 is 19, and 5 24, and 6 is 30, which amounting just to 3 Tens, set down a 0 again, and carry 3 for the 3 Tens, saying, 3 that you carry and 2 is 5, and 3 is 8, and 4 is 12, and 3 is 15, and 2 is 17, which being the last Row, set down 17, and the Total Sum is 1700 Ells; as may be seen in the *Example.*

The Reason for carrying One for every Ten, to the Left Hand is, because the Increase of every Place that Way, is by a ten-fold Proportion, as was said in *Numeration.*

Examples for Practice.

Yards.		*Gallons.*	*Pounds.*
74	Or thus	74	746
09		9	379
72		72	024
19		19	100
07		7	074
70		70	047
251		251	1370

Some chuse to omit the Cyphers on the Left Hand, as in the second *Example*: thinking it a little too precise, since Cyphers on the Left Hand signify nothing; but the other is best for a Learner, for his better understanding the Value of the Places, &c

More Examples.

l.	*Ells.*	*l.*
71	742	7444
17	371	270
46	462	5000
64	072	500
20	971	6742
2	674	240
56	321	52
65	015	9
341	3628	20257

Here follow some familiar *Examples*, shewing the Nature, and Use of this Rule, *viz.*

Question

Question 1. Between *London* and *Royston* are 33 Miles from thence to *Cambridge* 10; thence to *New market* 10 thence to *Bury* 10; thence to *Thetford* 10; thence to *Attleborough* 10; and from thence to *Norwich* 12 Miles How many Miles are there between *London* and *Norwich*

Set the Numbers down in the following Manner.

Miles
33
10
10
10
10
10
12

Between *London* & *Norwich* are 95 Miles

Question 2. Again, How many Days are there in these 12 Calendar Months, or Year?

	Days
January hath	31
February	28
March	31
April	30
May	31
June	30
July	31
August	31
September	30
October	31
November	30
December	31

Answ. 365

Question 3 Suppose a Farm contains these Acres in the several Fields following, *viz.*

	Acres.
In one Field	10
Another	15
Another	12
Another	20
Another	9
Another	6
And in another	22
How many Acres in all?	94 Answer.

Question 4. Admit a *Draper* measures 9 Pieces of Cloth, and their Contents are, *viz.*

N°.	*Yards.*	
1 *qt.*	25	
2	12	
3	25	
4	10	
5	9	*How many Yards in all?*
6	16	
7	10	
8	20	
9	8	
Answ.	135	

☞ Note, *That in setting down the Numbers, Care must be taken, not to place Units under the Place of Tens, but to put them properly, as in the* 5th *and last Article of the Sum above.*

Question 5.

Question 5. A *Corn-Factor* bought as follows, *viz.*

	qrs.
Wheat ———	56
Oats ———	45
Peas ———	124
Rye ———	72
Barley ———	120
	417 *Quarters in all.*

Question 6. A Ship from the *Indies*, whose Cargo is as follows, *viz.*

	l.
In *Pepper* ———	14280
Other Spices ———	9741
Diamonds ———	112579
Callicoes ———	47217
Muslins ———	74219
Drugs ———	11241
What is the Value of the whole?	269277 *l. Answer.*

Question 7. What Number is that from which, if you substract 18, the Remainder will be 24?

Answ. 42. *For if you add* 18 *and* 24 *together, they make* 42, *the Number sought.*

To prove ADDITION.

Begin at the Top, and cast it downwards, in the same Manner as you did upwards; and if the Figures or Cyphers of the Total prove the same as in casting upwards, the Work is right; otherwise they must be cast upwards and downwards 'till they do agree.

ADDITION of MONEY.

In *Addition* of several Denominations must be obſerv'd, how many of the ſmaller Name make one of the next greater: As how many *Farthings* make a *Penny*, how many *Pence* a *Shilling*, and how many *Shillings* a *Pound*. Therefore I ſhall place the ſeveral *Tables of Money*, *Weight*, *Meaſure*, &c. before the *Examples*, they being neceſſary to be firſt known.

Note, 4 *Fathings* make one *Penny*, 12 *Pence* one *Shilling*, and 20 *Shillings* one *Pound*.

In a Pound Sterling, are	20 *Shillings*
	240 *Pence*
	960 *Farthings*

Note alſo, That in *Addition of Engliſh Money*, *l.* ſtands for *Pounds*, *s.* for *Shillings*, *d.* for *Pence*, *qr.* for *Farthings*: Becauſe *Libra* ſignifies a *Pound*, *Solidus* a *Shilling*, *Denarius* a *Penny*, and *Quadrans* a *Farthing*.

But the beſt Way to ſet down *Farthings*, or Parts of a *Penny*, is

$\frac{1}{4}$ A *Farthing*, or Quarter of a Penny.
$\frac{1}{2}$ A *Half penny*, Half a Penny.
$\frac{3}{4}$ *Three Farthings*, Three Quarters of a Penny.

Example 1.

Suppoſe I owe to one Perſon, 5 *l.* 4 *s.* 6 *d.* to another *l.* 7 11 9, to another, *l.* 4 07 5, to another, *l.* 7 08 4 to another, *l.* 8 00 0, and to another, *l.* 9 07 6, how much do I owe in all to theſe ſeveral Perſons? To do this, theſe ſeveral Sums muſt be ſet down in ſuch order, that *Pounds* may ſtand under *Pounds*, *Shillings* under *Shillings*, and *Pence* under *Pence*, with Diſtances between them, as follows.

l.	s.	d.
5	04	6
7	11	9
4	07	5
7	08	4
8	00	0
9	07	6

In casting up this, and all other Sums in this Rule, you must Remember, That for every 4 in the *Farthings*, you must carry 1 to the Pence, because 4 *Farthings* make a Penny; for every 12 in the Pence, you must carry 1 to the Shillings, because 12 Pence makes a Shilling; and for every 20 in the Shillings, you must carry 1 to the Pounds, because 20 Shillings make a Pound; and the Pounds must be cast up as Sums of one Denomination, for every 10, carrying 1 to the next Row. And in all Additions, whether of *Money*, *Weight*, or *Measure*, &c. that Denomination towards the Left Hand (which is the first in setting down, but the last in casting up) must be so cast up.

The same being again set down with a Line drawn under it, appears thus;

l.	s.	d.
5	04	6
7	11	9
4	07	5
7	08	4
8	00	0
9	07	6
41	19	6

I begin at the smallest Denomination towards the Right Hand, (as in all *Additions* we must, whether of *Money*, *Weight* or *Measure*) to wit, *Pence*, and say, 6 and 4 is 10, and 5 is 15, and 9 is 24, and 6 is 30; now 30 Pence is 2 Shillings and 6 Pence, wherefore, I put down the 6 Pence under its own Rank, and carry 2 for the two Shillings

Shillings to the Rank of Shillings, saying, 2 that I carry and 7 is 9, and 8 is 17, and 7 is 24, and 11 is 35, and 4 is 39; now, 39 Shillings is 1 Pound 19 Shillings, wherefore I set down the 19*s.* under its own Rank, and carry the one Pound to the Pounds, saying, 1 that I carry, and 9 is 10, and 8 is 18, and 7 is 25, and 4 is 29, and 7 is 36, and 5 is 41; which being under the Title of Pounds, is forty one Pounds; so the whole Sum is, 41 *l* 19 *s.* 6 *d.* as in the *Example* may be seen.

Addition of several Denominations, is proved in the same Manner as *Addition* of One, by casting it downwards; and if it agrees with the Sum when cast upwards, it is right.

There is another Way used in *Schools*; that is, to cast up all again, except the upper Line, and then that Total they add to the upper Line, and if it agree with the Sum first found, it is right. But this Way is not so practical in Matters of real Business; therefore I prefer the other before it.

For the readier dispatch in casting up the Pence, 'tis very necessary to have the following Tables by Heart.

Pence		*s.*	*d.*		*Shil.*		*Pence*
20		1	8		1		12
30		2	6		2		24
40		3	4		3		36
50		4	2		4		48
60		5	0		5		60
70	is	5	10	Or, 12 times	6	is	72
80		6	8		7		84
90		7	6		8		96
100		8	4		9		108
110		9	2		10		120
120		10	0		12		144

Get these Tables by Heart, thus; 20 *d.* is 1 *s.* 8 *d*, 30 *d.* is 2 *s.* 6 *d*, &c.

Example 2.

Example 2.

Bought by a Country *Shopkeeper* in *London*, viz.

	l.	*s.*	*d.*
Linen Cloth, to the Value of ———	21	11	4
Sugars ———	7	10	
Tobaccoes ———	16	14	2
Wollen Cloths and Stuffs ———	37	10	
Fruit ———	11	16	8
Brandy and Waters ———	9	14	2
	104	16	4

How much did he lay out in all?

Begining at the Pence, I say, 2 and 8 is 10, and 2 is 12, and 4 is 16; and 16*d* is 1 *s* 4*d.* I set down the 4, and carry the Shilling to the next, the Place of Shillings, saying, 1 that I carry, and 4 is 5, (for I omit the tens of Shillings 'till I come to the Top) and 6 is 11, and 4 is 15 and 1 is 16; then I come downwards with the Tens, saying, 16 and 10 is 26, and 10 is 36, and 10 is 46, and 10 is 56, and 10 is 66, and 10 is 76 Shillings, which is 3 *l.* 16 *s.* I set down the 16 under the Place of Shillings, and carry the 3 Pounds to the Pounds, saying, 3 and 9 is 12, and 1 is 13, (for I go up but with one Row at a time) and 7 is 20, and 6 is 26, and 7 is 33, and 1 is 34, I set down 4, and carry 3, for the 3 Tens, (for the last Denomination must be cast up as Sums of one Denomination, for every 10 carrying 1, as was said before) and say, 3 that I carry, and 1 is 4, and 3 is 7, and 1 is 8, and 2 is 10; which being the last Row, I set it down. So the whole Sum is, 104 *l.* 16 *s* 4 *d.* as *per* the *Example.*

Example 3.

Example 3.

A *Merchant*, upon the ballancing of his Books finds he has in Money, Debts, and Goods, *viz.*

	l.	*s.*	*d.*
In Cash	2000	00	0
In Cambricks	60	00	0
In Tobacco's	47	16	6
By *Henry Harper*, owing	131	17	4
In Sugar	246	07	2
In Serges	70	11	0
By Voyage to *Lisbon*	724	06	7
In Indigo	370	12	0
By *William Waxham*	1000	00	0
In Cochineal	424	16	8
By Ship, *The Rose*	640	11	0
In *Canary* Wine	142	17	0
	5849	15	3

Example 4.

A *Brewer's Clerk* receives of several Persons as follows, *viz.*

	l.	*s.*	*d.*
Of *Laurence Lickspiggot*	12	04	0
—*Frank Froth*	9	10	4
—*Sam. Swigg*	20	11	6
—*Ben. Bumper*	36	16	8
—*Henry Here'st'ye*	24	00	0
—*Jack Stout*	8	16	6
Received in all, *l.*	112	09	0

Example 5.

A Collector of Excise receives in

	l.	s.	d.
Sussex ————	1420	10	6
Kent ————	0974	11	2
Surry ————	0641	17	4
Hampshire ————	1344	11	1
Hertfordshire ————	0741	17	4
Bucks ————	0617	10	0
Total—	5740	17	5

Example 6.

Sold by a *Hosier*,	l.	s.	d.	q.
4 *pr.* Silk Stockings, at ————	2	10	6	$\frac{2}{4}$
7 *pr.* Worsted ditto, at ————	1	15	2	$\frac{1}{4}$
9 *pr.* Thread Hose, at ————	0	18	3	$\frac{3}{4}$
12 *ps.* Childrens, at ————	2	07	6	$\frac{2}{4}$
3 *yds* Flannel, at ————	0	02	7	$\frac{1}{4}$
6 *pr.* Mill'd Hose, at ————	1	04	6	$\frac{3}{4}$
In all,	8	18	9	

Here I begin with the Farthings, saying, 3 and 1 is 4, and 2 is 6, and 3 is 9, and 1 is 10, and 2 is 12, which is Three-pence, which I carry to the Pence, &c.

Sometimes Sums are *Express'd* one Way, and *Set down* another, *viz.*

Example 7.

Example 7.

Expressed.		*Set down.*		
		l.	*s.*	*d.*
For	Coals, *Six and Thirty Shillings*	1	16	0
	Cloth, *Seven and Fifty Shillings*	2	17	0
	Sum,	4	13	0

Example 8.

	l.	*s.*	*d.*
A Guinea	1	01	0
A Mark	0	13	4
An Angel	0	10	0
A Noble	0	06	8
A Crown	0	05	0
A Half-Crown	0	02	6
Total,	2	18	6

Example 9.

Expressed.	*Set down.*		
	s.	*d.*	*q.*
Mutton, *Eight Groats*	2	8	
Onions, *Seven Farthings*	0	1	$\frac{3}{4}$
Tobacco, *Two and Twenty Pence*	1	10	
Wine, *Fifteen Pence*	1	3	
Thread, *Three Half pence*	0	1	$\frac{1}{2}$
Soap, *Nineteen Pence*	1	7	
Veal, *Eleven Groats and Two Pence*	3	10	
Sum,	11	5	$\frac{1}{4}$

Tho'

Tho' when ſome of theſe Sums are to ſtand alone, and not in Order of *Pounds*, *Shillings*, and *Pence*; as in a Letter, &c. 'tis better to ſet them down as ſpoken; As 15 *d.* 45 *s.* &c. rather than 1 *s.* 3 *d*, or 2 *l.* 5 *s.*

☞ Note, *That in ſetting down your Sums*, *Care muſt be taken*, *that you do not ſet down more*, *or ſo much in the place of a leſſer Denomination*, *than makes one of the next greater: For 'twould be abſurd to write down* 18 l. 22 s. 15 d. *for* 19 l. 03 s. 3 d. Or, 15 C. 3 q. 29 ℔. *for* 16 C. 0 q. 1 ℔.

Some uſed formerly, (and ſome of weak Heads do now) to make a *Point*, or *Stop*, at every four in the Farthings; at every 12 in the Pence; at every 20 in the Shillings; and at every 10 in the Pounds; if they conſiſt of ſeveral Ranks, carrying ſo many Ones, as they find Points or Specks in one Denomination, to the next: But this Way is both tedious and ſlovenly. But if your Sums are very large, you may make a *Stop* at every 60, in the Pence, for 5 *s.* and carry accordingly to the Shillings; and for the Units Rank in Shillings, caſt them up as Sums of one Denomination, for every Ten carrying One to the Tens of Shillings, and reckon them as ſo many Ones; and when you came up to the Top, halve them, which Half, carry to the Pounds; but if they halve not even, ſet down the odd One, in the Ten's Place of *Shillings*, &c. *Examples* of which, you will find in the following Page.

Whenever there is a Neceſſity to *Point*, or *Stop*, do it rather upon your Nail, or on a Bit of Paper, than in your Book, or Paper where the ſum is; becauſe, in proving it, the Points very rarely happen in the ſame Place; and the many *Stops* may be apt to confound you, and alſo make the Work appear foul.

Example 10.

Example 10.			*Example* 11.		
l.	*s.*	*d.*	*l.*	*s.*	*d.*
16	17*	10	714	19	6
47	11	6	412	10	7
74	06	9	374	11	9
54	19	7	241	14	5
45	09	8	474	16	4
72	14	5	372	12	6
27	04	3	330	12	9
16	07*	9	200	07*	9
61	17	8	472	12	7
24	06	7	521	09	6
42	17	5	245	17	8
24	19	7	324	12	2
47	11	5	725	15	4
74	01	9	317	13	9
41	00	7	972	14	5
36	17	5	321	15	7
47	17	9	733	17	3
20	10	11	245	11	1
777	12	10	8004	04	11

Here, in the 10th *Example*, I begin at the bottom, saying thus, 11 and 9 is 20, &c. till I come to the Article 24*l.* 6 *s* 7 *d.* where the Figures amount to 65, where I make a *Point*, or *Stop*, for 5 *s.* and carry 5 to the next Figure over it, saying, 5 and 8 is 13, &c. till I come to the Article, 47 *l.* 11 *s* 6 *d* where it amounts to just 60: and there I make another *Point* for 5 *s.* more; and for the odd 10 *d.* I set it down in its Place, and carry the two 5's making 10, to the Shillings, saying, 10 and 7 is 17, and 7 is 24, &c. till I come to the Top, where it amounts to 102; wherefore I set down 2, and carry 10 to the Tens of *Shillings*; saying, 10 and 1 is 11, &c. And

And at the Top it comes to 21, the Half of which is 10, and 1 over, which I place on the Left Hand of the 2, and it makes 12 *s.* and I carry the 10 to the Pounds, saying, 10 and 7 is 17, and 6 is 23, &c. casting the *Pounds* up as Sums of one Denomination; and the Totol is 777 *l.* 12 *s.* 10 *d.* As in the *Example* may be seen.

Or the *Shillings* may be cast up by *Pointing* at every 60, and 40, in the Unit Rank of *Shillings*, which make 5 *l.* As at the Articles, *l.* 16 - 07 - 9* and *l.* 16 - 17 - 13* or uppermost Number, where a small *Asterism* is placed, to denote it accordingly. At the Top it comes to 42; I set down 2, and carry 5 *l.* to the Tens of *Shillings*, taking two of them as I go up, for 1 *l.* saying, 5 I carry, and 1 is 6, and 1 7, &c.

AVOIRDUPOIS-WEIGHT.

By this Weight is weighed all Kind of *Grocery* Wares; or Goods subject to waste; as *Tobacco*, *Sugar*, *Fruit*, *Drugs*, *Butter*, *Cheese*, *Allom*, *Iron*, *Brass*, *Lead*, *Soap*, *Tallow*, *Pitch*, *Rozin*, *Tin*, *Salt*, *Wax*, *Flax*, *Hemp*, and all Kind of Garble Goods, &c.

A Table of Avoirdupois-Weight.

			Marks
16 Drams		1 Ounce	*oz.*
16 Ounees		1 Pound	℔.
28 Pounds	make	1 Quarter of a Hund.	*qr.*
4 Quarters		1 Hundred	*C.*
20 Hundred		1 Tun	*T.*

⁂ Note, *A Pound* Avoirdupois-Weight, *is equal to* 14 *Ounces*, 12 *Penny-Weight*, Troy.

In a Tun Weight are
573440 *Drams*
35840 *Ounces*
2240 *Pounds*
80 *Quarters*
20 *Hundreds Weight of* 112 ℔ *each*

AVOIRDUPOIS Great Weight.

Examples.

(10) Tuns	(20) C.	(4) q.	(28) ℔
7	14	3	12
5	19	1	06
9	07	1	00
7	07	2	12
2	15	0	20
9	17	3	21
43	02	0	15

(10) Tuns	(20) C.	(4) q.	(28) ℔
7	11	1	12
7	07	2	15
4	09	1	17
6	15	1	06
6	07	1	14
2	17	0	19
35	08	0	27

Here you muſt begin at the leaſt Denomination towards the Right Hand (as before in Money) *viz.* Pounds ; ſaying, 21 and 10 is 31, (taking but one 10 in the 20, for the eaſier Reckoning) which is 3 above 28 ; make a *Point* on your Nail for the Quarter, and ſay, 3 and 10 that Was left in the 20, is 13, and 12 is 25, and 6 is 31 ; make another *Point*, and ſay, 3 and 12 is 15, which ſet down under its own Rank ; and for the two *Points*, or *Stops*, made for the Quarters, carry 2 to the Quarters, ſaying, 2 and 3 is 5, and 2 is 7, and 1 is 8, and 1 is 9, and 3 is 12; now 12 Quarters, is juſt 3 *C.* wherefore ſet down a 0, and carry 3 to the Hundreds ; and

and proceed as in *Money*, (20 *C.* making a *Tun*, as 20 *s.* did a Pound) ſaying, 3 and 7 is 10, and 5 is 15, and 7 is 22, and 7 is 29, and 9 is 38, and 4 is 42; and coming down with the Tens, ſay, and 10 is 52, and 10 is 62, and 10 is 72, and 10 is 82, which is 4 *Tuns*, and 2 *C.* over; which I ſet down, and carry 4 to the *Tuns*, ſaying, 4 and 9 is 13, and 2 is 15, and 7 is 22, and 9 is 31, and 5 is 36, and 7 is 43; and ſo the Sum is finiſhed, the Total being 43 *Tuns*, 02 *C.* 0 *qr.* and 15 ℔. As in the Example may be ſeen.

The Figures over the Title of each reſpective Denomination, ſhews what you muſt ſtop or point at; and are diſtinguiſh'd thus; (10) (20) (4) and (28)

More Examples for Practice.

(10) *Tuns*	(20) *C.*	(4) *q.*	(28) ℔	(10) *Tuns*	(20) *C.*	(4) *q.*	(28) ℔
74	13	0	15	74	14	1	16
46	11	1	17	41	06	1	11
44	09	2	06	24	15	2	07
74	19	3	16	19	06	3	15
44	07	0	24	26	14	1	07
74	14	1	15	14	12	2	15
359	15	2	06	201	10	0	15

Twelve

Twelve Hogsheads of Tobacco, containing, *viz.*

N°.	C.	qr.	lb.	N°.	C.	qr.	lb.	Tare
1	7	3	12	7	5	1	24	90
2	4	1	17	8	4	2	19	94
3	9	0	24	9	4	3	23	99
4	6	3	26	10	3	3	21	84
5	5	1	17	11	4	1	23	79
6	4	2	20	12	4	3	24	96
	38	2	04		28	1	22	542

71	1	19	46	1	19
47	3	24	24	3	03
57	2	16	23	0	21
71	0	21	67	2	13
47	1	12	27	1	17
51	2	06	34	3	23
347	0	14	224	1	12

Avoirdupois *Small Weight.*

This is in use chiefly for *Silk* ; as among *Stocking-makers*, *Weavers*, &c. they delivering their *Silk*, out and in, by *Pounds*, *Ounces*, and *Drams*.

Example

Examples.

	(16)	(16)		(16)	(16)
lb.	oz.	dr.	lb.	oz.	dr.
4	10	06	4	11	14
7	14	12	2	13	12
5	07	04	7	10	15
9	14	15	4	07	14
4	05	07	6	09	00
6	11	14	9	07	16
39	00	10	30	13	07

But in weighing Worsted, and some other Things, 'tis usual to go no lower than a quarter of an Ounce; as in these *Examples.*

	(16)	(4)		(16)	(4)
lb.	oz	qr.	lb.	oz.	qr.
4	13	1	9	07	2
7	12	2	7	10	1
9	11	3	8	15	3
7	04	2	7	12	2
4	13	1	3	13	3
34	07	1	37	11	3

Wool is also weighed by *Avoirdupois* Weight, but differently divided, according to the following Table, *viz.*

Note that	7 Pounds is one Clove,	or,	*l.*
	2 Cloves, one Stone,		14
	2 Stone, one Tod,		28
	$6\frac{1}{2}$ Tod, one Wey,		182
	2 Weys, one Sack,		364
	12 Sacks, one Last.		4368

And in a *Last* of *Wool*, are	4368 Pounds
	624 Cloves
	312 Stone
	156 Tod
	24 Weys
	12 Sacks

Note, That the Wey differs in some Counties; as in *Suffolk*, the Wey is 336 *lb.* or 42 Cloves; in *Essex*, 256 or 32 Cloves; and according to the Division above; 182 *lb.*

TROY WEIGHT.

By this Weight are weighed *Jewels*, *Gold*, *Silver*, *Pearl*, *Electuaries*, *and Liquors* A Pint of *Water*, *Wine*, &c. being a Pound. And the usual Denominations are *Pounds*, *Ounces*, *Penny-Weights*, and *Grains*, as in the following Table.

Note,	24 *Grains*	make	1 *Penny-Weight*
	20 *Penny-Weight*		1 *Ounce*
	12 *Ounces*		1 *Pound*

In a Pound *Troy*, are	5760 *Grains*
	240 *Penny-Weight*
	12 *Ounces*

25 *l.* 1 Quarter of a Hundred.
100 *l.* 1 Hundred Weight.
20 Hundred 1 Tun of Gold or Silver.

The

The Value of Gold.	l. s. d.	*The Value of Silver.*	l. s. d.
1 Pound Wt. is worth	48 00 0	1 Pound Wt.	3-02-0
1 Ounce,	4 00 0	1 Ounce,	0 05-2
1 Penny-Weight,	0 04-0	1 Penny Wt.	0-00-3$\frac{1}{10}$
1 Grain,	0-00 2	1 Grain, $\frac{1}{2}$ a *Farthing.*	

A Tun of Gold at 4 *l.* the Ounce, *l.* 96000.
A Tun of Silver at 5 *s.* the Ounce, *l.* 6000.

Examples of Troy Weight

	(12)	(20)	(24)
l.	*oz.*	*dwt.*	*gr.*
5	10	12	20
5	04	05	13
7	07	07	05
5	04	19	14
4	11	04	14
6	04	17	21
34	07	03	16

	(12)	(20)	(24)
l.	*oz.*	*dwt.*	*gr.*
5	10	10	11
4	11	17	15
6	10	01	16
5	06	14	15
4	10	14	17
2	05	04	07
30	07	03	04

(10)	(20)	(24)
oz.	*dwt.*	*gr.*
24	13	10
19	11	15
07	04	14
21	13	16
11	05	23
08	04	12
14	07	10
15	10	11
122	11	15

(10)	(20)	(24)
oz.	*dwt.*	*gr.*
105	10	05
217	06	08
360	03	06
195	11	07
217	02	09
196	02	08
321	07	05
172	03	11
1785	11	11

Here is no Occasion for Pointing, but only in the Grains: But if you do stop at more, only mind the Figures over the Titles, as before in *Avoirdupois Weight*, and they direct at what to point.

Note, A Pound *Troy* is about 13 Ounces, 2 Drams and a half *Averdupois*; or as 17 to 14; and the Ounce *Troy* as 51 to 56.

		l.	*s.*	*d.*
A Pound *Troy* of Gold	is worth	48	00	0
A Pound *Avoirdupois* of Gold	is worth	58	08	0
A Pound *Troy* of Silver	is worth	03	03	0
A Pound *Avoirdupois* of Silver	is worth	03	15	3½

	lb.	oz.		
100*l.* in Gold, weighs	1	11	¾	*Averdupois.*
100*l.* in Silver, weighs	26	04	0	*Averdupois.*

A Pound *Avoirdupois* is heavier than a Pound *Troy*; but the Ounce *Avoirdupois* is lighter than the Ounce *Troy*; for the Ounce *Troy* weighs 480 Grains, but the Ounce *Avoirdupois* but 438 Grains.

APOTHECARIES WEIGHT.

Apothecaries have their Weight deduced from *Troy*; their Pound being the same. to wit, 12 Ounces; but differently divided, as follows. *viz.*

			Marks.
20 Grains	make	1 Scruple	℈
3 Scruples	make	1 Dram	ʒ
8 Drams	make	1 Ounce	℥
12 Ounces	make	1 Pound	℔

By these Weights *Apothecaries* compound their Medicines; but they buy and sell their Drugs by *Avoirdupois* Weight.

Exemplum.

Example.

	(12)	(8)	(3)	(20)
℔	℥	ʒ	℈	gr.
4	10	7	2	19
3	10	6	1	10
2	09	5	0	06
1	08	4	2	04
1	06	3	1	12
1	00	0	0	00
15	10	3	2	11

(10)	(12)	(8)	(3)	(20)
℔	℥	ʒ	℈	gr.
48	07	1	1	17
12	11	4	2	12
24	06	7	1	07
19	10	5	2	12
34	07	6	0	00
24	04	4	1	15
165	00	6	1	03

In a Pound are
5760 Grains
288 Scruples
96 Drams
12 Ounces.

CLOTH MEASURE.

Note, that	4 Nails	make	1 Quarter
	4 Quarters		1 Yard
	5 Quarters		1 Ell *English*
	3 Quarters		1 Ell *Flemish*.

Qr.		*Nails.*		
3	or	12	make	1 Ell *Flemish*
4		16		1 Yard.
5		20		1 Ell *English*
6		24		1 *French* Aulme, or Ell.

Examples.

Yds.	*qrs.*	*Nls.*	*El.Eng.*	*qrs.*	*Nls.*	*El.Fle.*	*qrs.*	*Nls.*
(10)	(4)	(4)	(10)	(5)	(4)	(10)	(3)	(4)
14	1	3	24	3	3	25	2	3
21	2	2	17	4	1	36	1	2
56	1	0	46	2	2	42	2	3
42	2	3	27	1	0	54	2	1
17	0	1	34	4	3	61	1	2
24	1	2	51	2	2	72	5	3
176	1	3	202	3	3	294	1	2

LIQUID MEASURE.

Is of two sorts; one for *Wine*, *Spirits*, *Oil*, &c. And the other for *Ale* and *Beer*. The Tables of which are as follows.

In WINE MEASURE,

231 solid Inches,	make	1 Gallon
42 Gallons,	make	1 Tierce
63 Gallons, or 1 Tierce & $\frac{1}{2}$	make	1 Hogshead
2 Hogsheads	make	1 Pipe, or Butt
2 Pipes or Butts	make	1 Tun
84 Gallons	make	1 Puncheon.

In a Tun are,
2016 Pints
1008 Quarts
252 Gallons
14 Rundlets
6 Tierces
3 Puncheons
4 Hogsheads
2 Pipes, or Butts

Note.

Note, 18 Gallons is a Rundlet.
32 $\frac{1}{2}$ Gallons, is a *Wine*, or *Vinegar* Barrel.
A Tun weighs 18 C. *Avoirdupois*.

Note, *Oil and Honey are measured by Wine Measure.*

Note, That *Sweet Oil* hath but 236 Gallons to the Tun, but *Whale-Oil*, or *Oil* from *Greenland*, hath 252 to the Tun.

In BEER MEASURE.

282 solid Inches	make	1 Gallon
9 Gallons	make	1 Firkin
2 Firkins	make	1 Kilderkin
2 Kilderkins	make	1 Barrel
1 $\frac{1}{2}$ Barrel, or 54 Gallons	make	1 Hogshead

Note, *That in all other Places besides* London, *the Firkin of Beer and Ale contains* 8 $\frac{1}{2}$ *Gallons.*

In a Barrel of *Beer* are
10152 solid Inches
288 Pints
144 Quarts
72 Pottles
36 Gallons
4 Firkins
2 Kilderkins.

Note, That 3 Barrels, or 108 Gallons, make 1 Butt of *Beer*.

ALE MEASURE.

282 solid Inches	make	1 Gallon
8 Gallons	make	1 Firkin of *Ale*, *Soap*, or *Herrings*
2 Firkins	make	1 Kilderkin
1 $\frac{1}{2}$ Barrel, or 48 Gall.	make	1 Hogshead.

In a Barrel of *Ale* are
9024 solid Inches.
256 Pints.
128 Quarts
64 Pottles
32 Gallons
4 Firkins
2 Kilderkins

The *Beer* and *Ale* Gallons are the same, *viz.* 282 solid Inches, but with the Difference, *i. e* the Barrel of *Beer* contains 1128 Cubick Inches more than the Barrel of *Ale*, that is, 4 Gallons.

Examples of Wine-Measure.

(10) Tuns	(4) Hds.	(63) Gal.	(8) Pints.
71	2	19	4
24	1	27	6
12	2	56	4
42	0	37	7
16	3	60	3
166	3	12	7

(10) Tuns.	(4) Hds.	(63) Gal.	(8) Pints.
75	2	24	7
44	1	17	2
27	1	46	6
29	1	19	4
24	3	46	4
201	2	28	7

DRY MEASURE.

By this are measured, all sorts of *Grain*, *Salt*, *Sea-Coal*, &c.

Note, That

2 Pints	make	1 Quart
2 Quarts	make	1 Pottle
2 Pottles	make	1 Gallon
2 Gallons	make	1 Peck
4 Pecks	make	1 Bushel
8 Bushels	make	1 Quarter, or 2 Combes.
4 Quarters	make	1 Chaldron
5 Quarters	make	1 Wey
2 Weys	make	1 Last.

Note,

Note, Four Pecks is one Bushel Land-Measure; and 5 Pecks one Bushel Water-Measure.

Observe likewise, That when *Salt* and *Sea-Coal* are measured by the Corn-Measure, they are heaped; or else there are 5 striked Pecks to the Bushel; and 36 Bushels is a Chaldron of Coals; there being 21 Chaldrons to the Score, in the River of *Thames*.

A Gallon contains 268$\frac{4}{5}$ Cubick Inches; and a Bushel of Corn, 2150$\frac{2}{5}$ Cubick Inches.

Note, A Bushel ought to be 18$\frac{1}{2}$ Inches wide, and 8 Inches deep, as by Act of Parliament, in 1697.

Some make 6 Quarters of Meal a Wey; and 1 Wey 5 Quarters, a Last.

Examples of Dry Measure.

(10)	(8)	(4)	(2)
Qu.	*Bush.*	*Pecks*	*Gal.*
24	6	2	1
17	3	2	0
20	7	1	1
15	5	0	
21	2	1	1
19	4	2	0
119	5	2	0

(10)	(4)	(8)	(4)
Ch.	*Qu.*	*Bush.*	*Pecks.*
174	3	6	3
241	1	7	2
296	2	4	3
171	1	5	0
097	0	5	2
471	2	4	3
1453	1	2	1

LONG MEASURE.

Note

3 Barley-Corns make one Inch
12 Inches one Foot
3 Foot one Yard
3 Foot 9 Inches one Ell
2 Yards, or 6 Foot, one Fathom
5 Yards $\frac{1}{2}$, or 16 Foot and $\frac{1}{2}$, one Pole
40 Square Poles, or 220 Yards, one Furlong
8 Furlongs, or 1760 Yards, one Mile
3 Miles one League
20 Leagues, or 60 Miles, 1 Degree
360 Degrees, or 21600 Miles is supposed to be the Circumference of the Earth and Sea.

Note, That an *English* Mile is 286 Feet less than an *Italian* Mile. And that 5 Foot is a Geometrical Pace.

In a Mile are

190080	Barley-Corns
63360	Inches
5280	Feet
1760	Yards
320	Poles
8	Furlongs
80	Chains
1056	Paces
1480	Ells
8000	Links of the Chain.

Examples

Examples in Long Measure.

(16) Miles	(8) Furl.	(40) Poles.
24	6	22
37	5	26
15	4	34
74	3	39
41	7	24
194	4	25

(10) Miles.	(8) Furl.	(40) Poles.
37	4	21
20	3	17
42	5	19
31	6	27
52	4	19
185	0	23

From the preceding Table of *Long-Measure*, is deduced this of *Land-Measure*, viz.

Forty Poles (or Perches) in Length, and 4 in Breadth, makes an Acre, or 160 square Perches. Or 4840 square Yards make an Acre; or 43560 square Feet.

A *Hide* of Land is 100 Acres; 40 square Poles make a Rood, and 4 Roods an Acre.

Note, The Pole, or Perch, of 16 Foot $\frac{1}{2}$ is *Statute-Measure*; but there are some customary Measures which are more; as for Fens and Wood Lands, there are reckonned 18 Foot to the Pole; and for Forests, 21 Foot to the Pole.

Examples.

(10) Acres	(4) Roods	(40) Poles
14	2	24
26	3	29
17	1	19
26	2	20
36	2	36
24	1	12
146	2	20

(10) Acres	(4) Roods	(40) Poles
74	2	27
61	1	20
20	2	36
14	3	11
37	1	10
27	2	34
236	2	18

TIME

TIME.

Is meaſured by Years, Months, Days, Hours; and Minutes; as in the Table following.

Mark'd.			*In a Year are*
60″ Seconds	make	1 Minute	31557600 *Sec.*
60′ Minutes		1 Hour	525960 *Min.*
24 Hours		1 day natural	8766 *Hrs.*
7 Days		1 Week	365 *Days.*
4 Weeks		1 Month	52 *Weeks*
13 Months, 1 Day, and 6 Hours		1 Solar Year	

A *Century* is 100 Years; an *Indiction* among the *Romans*, a Revolution of 15 Years.

Of the Motion *of the Heavenly Bodies.*

60 Seconds	make	1 Minute
60 Minutes, or Miles		1 Degree
30 Degrees		1 Sign
12 Signs, or 360 Deg.		1 Revolution of the whole Sphere, or 360 Degrees.

DOZENS.

There are ſeveral Commodities ſold by the Dozen, a Table of which follows, *viz.*

In a great Groſs are	1728 Pieces or Things
	144 Dozens
	12 ſmall Groſs

SQUARE

Square Measure.

16	Quarters of an Inch	make	one Inch
144	Inches		one Foot
9	Foot		one Yard
30	Yards $\frac{1}{2}$, or 272 $\frac{1}{4}$ square Feet		one Pole
40	Poles long, and 1 broad		one Rood
4	Roods		one Acre
640	Acres		one Mile

In a square Acre are 4 square Roods, 160 square Poles, &c. and in a square Pole, 30 square Yards $\frac{1}{4}$.

In a square Mile are

4014489600	Inches
27878400	Feet
3097600	Yards
102400	Poles
2560	Roods
640	Acres

Some other Things necessary to be known, and of Use in Arithmetick.

Of FISH.

120 of *Ling*, *Codd*, or *Haberdine*, to the 100, *viz.*

120	accounted	100
1200		1000, or a Barrel
10000		A Last, or 12 Barrels

Paper and Parchment.

1 Bale is 5 Bundles; 1 Bundle, 2 Reams; 1 Ream, 20 Quires; 1 Quire, 24 (or 25) Sheets. 1 Roll of Parchment, 5 Dozen; 1 Dozen, 12 Skins.

Of

Of WOOD.

A Cord of wood is 4 Foot over, 4 Foot deep, and 8 Foot long, being 128 Cubick Feet. A Stack of Wood is 3 Foot over, 3 Foot deep, and 12 Foot long, being 108 Cubick Feet.

Black Wood, being great Logs, are sold by the Cord, and small by the Stack. A Cubick Foot is 1728 Cubick Inches. A Cubick Yard, 27 Cubick Feet, or 46656 Inches. 4 Inches is a Hand, in measuring a Horse. 2 Foot is 1 Pace. 4 Poles, or 100 Links, 1 Chain. 125 Geometrical Paces 1 Stade. 8 Stades an *Italian* Mile. 4000 Geometrical Paces a Small *German* Mile, and 5000 a Great. 160 Perches in Length, and 1 in Breadth; or 80 in Length, and 2 in Breadth; or 40 in Length, and 4 in Breadth, make an Acre of Land. 10 Foot every way is a *Square*; that is, 100 square Feet. A Faggot of *Steel*, 120 lb, A Burthen of *Gad-Steel*, 9 Score, or 180 lb. A Sack of Coals, 3 Bushels; *Scots* Coals, 112 lb. to the C. A Load of Timber 50 Foot, a Tun 40. A Load of Hay 36 Trusses, and 56 pound the Truss; or 4 Stone, at 14 pound the Stone; but New Hay ought to be 60 pound the Truss. 500 of Bricks a Load; and 1000 plain Tiles the same. 35 Bushels of Lime 1 C. A Brick ought to be 9 Inches long, 4 ½ broad, and 2 ½ thick. A Tun of Train-Oil 252 Gallons; a Tun of sweet-Oil 236 Gallons. Raw Silk (except *China*) is 24 Ounces to the Pound. A Tun of Lead, called a Fodder, 19 ½ C. A Gallon of wheaten Meal weighs 7 Pound *Avoirdupois*. A Dicker of Hides, or Skins, are 10; and 20 Dickers a Last. A Stone of Glass is 5 Pound; a Seam of Glass is 24 Stone. 40 Skins make a Timber of *Sables, Martins, Minks, Jennits, Fitches, and Greys*. 120 to the Hundred, of *Coney, Kid, Lamb, Budge*, and *Cats Skins*; 50 to a Kip of *Goat-Skins*; and 13 Tann'd *Calf-Skins* a Dozen.

SUB-

CHAP. III.

SUBTRACTION.

IS the taking of a lesser Number, or Sum, out of a greater, thereby to find the Remainder, or Difference, between the said two Numbers: As if you take 13 from 19, the Remainder or Difference is 6.

Subtraction is of one Denomination, or of divers.

Of one, when the two Numbers are both of one kind, that is, both *Yards*, *Gallons*, *Pounds*, &c.

Of divers, when the two Sums consist of *Pounds*, *Shillings*, and *Pence*; or *Tuns*, *Hundreds*, *Quarters*, and *Pounds*, &c.

Subtraction is just the Reverse of *Addition*; for that puts Numbers together, but *this* takes Numbers from each other.

In setting down Numbers for Work, you must always place the greater Number or Sum uppermost; and in such Order, that Units may stand under Units, Tens under Tens, Hundreds under Hundreds, &c. as before in *Addition*.

A General Rule.

Whatever you stop at in *Addition*, the same you must borrow in *Subtraction*, when Need requires, remembring always to pay it to the next Figure towards the Left Hand.

Example

Example I.

Suppose I would know the Difference between 453 Yards bought, and 232 Yards sold.

I set them down as underneath, and as before recited, *viz.*

	Yards:	
Bought	453	Great Number
Sold	232	The Lesser
Differ.	221	Rema. unsold
	453	Proof

After I have drawn a Line under the Sum, I begin at the first Figure towards the Right Hand, (as in *Addition*) and say, 2 from 3 (the Figure just over it) and there remains 1, setting it in its proper Place under the Line; and then go to the next Figure, saying, 3 from 5, and there remains 2, which I also put under the Line; and then to the last Figure, saying 2 from 4, and there remains 2, and the Work is done; and I find the Remainder of Yards unsold to be 221; or that 453 is 221 more than 232; to prove the Truth of which I add the Remainder, or Difference, to the lesser Number, and if they two put together, make the greater or upper Number, the Sum is right, otherwise not; wherefore I say, 1 and 2 is 3, and 2 and 3 is 5, and 2 and 2 is 4, which are the same Figures with the upper or greater Number. Wherefore I know the Work is right, as may be seem in the Example. And by this Way are all Sums of one Denomination proved in this Rule.

Example 2.

Let it be required to find the Difference between 756 Gallons received, and 444 Gallons delivered. To do which,

which I ſet the Numbers, the one under the other, as before directed, and they ſtand thus.

Gall.	
756	Greater
444	Leſſer
312	Rem.
756	Proof

Then having drawn a Line under them, I begin and ſay 4 from 6, and there reſts 2; and 4 from 5 and there remains 1; and 4 from 7, and there remains 3: So the Work being done, I find the Difference to be 312; or ſo many Gallons remaining. And it is proved by *Addition*, as before; as may be ſeen by the Work above.

When any one of the under Figures is greater than the Figure over it, then you muſt borrow 10 (as you carried 10 in *Addition*) and put it to the Figure from whence you were to ſubtract, and then take it from their Sum, paying 1 for the ſaid 10 borrowed, to the next Figure towards the left Hand in the lower Line.

Example 2.

I would ſubtract 496 Pounds paid, from 654 Pounds lent, *viz.*

	l.	
Lent	654	*Greater*
Paid	496	*Leſſer*
	158	Reſts due
	654	Proof

Having ſet down the Numbers, as before directed, with a Line under them, I ſay, 6 from 4 I cannot, but

Examples.

Yds.	*qrs.*	*Nls.*	*El.Eng.*	*qrs.*	*Nls.*	*El.Fle.*	*qrs.*	*Nls.*
(10)	(4)	(4)	(10)	(5)	(4)	(10)	(3)	(4)
14	1	3	24	3	3	25	2	3
21	2	2	17	4	1	36	1	2
56	1	0	46	2	2	42	2	3
42	2	3	27	1	0	54	2	1
17	0	1	34	4	3	61	1	2
24	1	2	51	2	2	72	5	3
176	1	3	202	3	3	294	1	2

LIQUID MEASURE.

Is of two sorts; one for *Wine*, *Spirits*, *Oil*, &c. And the other for *Ale* and *Beer*. The Tables of which are as follows.

In WINE MEASURE,

231 solid Inches,	make	1 Gallon
42 Gallons,	make	1 Tierce
63 Gallons, or 1 Tierce & 1/2	make	1 Hogshead
2 Hogsheads	make	1 Pipe, or Butt
2 Pipes or Butts	make	1 Tun
84 Gallons	make	1 Puncheon.

In a Tun are,
2016 Pints
1008 Quarts
252 Gallons
14 Rundlets
6 Tierces
3 Puncheons
4 Hogsheads
2 Pipes, or Butts

Note,

Note, 18 Gallons is a Rundlet.
$32\frac{1}{2}$ Gallons, is a *Wine*, or *Vinegar* Barrel.
A Tun weighs 18 C. *Avoirdupois*.

Note, *Oil and Honey are measured by Wine Measure.*

Note, That *Sweet Oil* hath but 236 Gallons to the Tun, but *Whale-Oil*, or *Oil* from *Greenland*, hath 252 to the Tun.

In BEER MEASURE.

282 solid Inches	make	1 Gallon
9 Gallons		1 Firkin
2 Firkins		1 Kilderkin
2 Kilderkins		1 Barrel
$1\frac{1}{2}$ Barrel, or 54 Gallons		1 Hogshead

Note, *That in all other Places besides* London, *the Firkin of Beer and Ale contains* $8\frac{1}{2}$ *Gallons.*

In a Barrel of *Beer* are
10152 solid Inches
288 Pints
144 Quarts
72 Pottles
36 Gallons
4 Firkins
2 Kilderkins.

Note, That 3 Barrels, or 108 Gallons, make 1 Butt of *Beer*.

ALE MEASURE.

282 solid Inches	make	1 Gallon
8 Gallons		1 Firkin of *Ale*, *Soap*, or *Herrings*
2 Firkins		1 Kilderkin
$1\frac{1}{2}$ Barrel, or 48 Gall.		1 Hogshead.

In a Barrel of *Ale* are
9024 solid Inches.
256 Pints.
128 Quarts
64 Pottles
32 Gallons
4 Firkins
2 Kilderkins

The *Beer* and *Ale* Gallons are the same, *viz.* 282 solid Inches, but with the Difference, *i. e* the Barrel of *Beer* contains 1128 Cubick Inches more than the Barrel of *Ale*, that is, 4 Gallons.

Examples of Wine-Measure.

(10) *Tuns*	(4) *Hds.*	(63) *Gal.*	(8) *Pints.*
71	2	19	4
24	1	27	6
12	2	56	4
42	0	37	7
16	3	60	[illegible]
166	3	12	7

(10) *Tuns.*	(4) *Hds.*	(63) *Gal.*	(8) *Pints.*
75	2	24	7
44	1	17	2
27	1	46	6
29	1	19	4
24	3	46	4
201	2	28	7

DRY MEASURE.

By this are measured, all sorts of *Grain, Salt, Sea-Coal*, &c.

Note, That

2 Pints	make	1 Quart
2 Quarts	make	1 Pottle
2 Pottles	make	1 Gallon
2 Gallons	make	1 Peck
4 Pecks	make	1 Bushel
8 Bushels	make	1 Quarter, or 2 Combes.
4 Quartrs	make	1 Chaldron
5 Quartrs	make	1 Wey
2 Weys	make	1 Last.

Note,

Note, Four Pecks is one Bushel Land-Measure; and 5 Pecks one Bushel Water-Measure.

Observe likewise, That when *Salt* and *Sea-Coal* are measured by the Corn-Measure, they are heaped; or else there are 5 striked Pecks to the Bushel; and 36 Bushels is a Chaldron of Coals; there being 21 Chaldrons to the Score, in the River of *Thames*.

A Gallon contains 268$\frac{4}{5}$ Cubick Inches; and a Bushel of Corn, 2150$\frac{2}{5}$ Cubick Inches.

Note, A Bushel ought to be 18$\frac{1}{2}$ Inches wide, and 8 Inches deep, as by Act of Parliament, in 1697.

Some make 6 Quarters of Meal a Wey; and 1 Wey 3 Quarters, a Last.

Examples of Dry Measure.

(10) *Qu.*	(8) *Bush.*	(4) *Pecks*	(2) *Gal.*
24	6	2	1
17	3	2	0
20	7	1	1
15	5	0	
21	2	1	1
19	4	2	0
119	5	2	0

(10) *Ch.*	(4) *Qu.*	(8) *Bush.*	(4) *Pecks.*
174	3	6	3
241	1	7	2
296	2	4	3
171	1	5	0
097	0	5	2
471	2	4	3
1453	1	2	1

And so of any other Number proposed to be made up by different Numbers, let them be 5, 6, 7, &c. Remembering always, that the random Numbers be less than the Numbers proposed to make up the Number assigned.

Of MONEY.

When the Sums to be subtracted are of divers Denominations, whether they be *Money*, *Weight*, or *Measure*, the same Method must be observed in setting them down as in *Addition*; that is, the several Names must be set just under one another; as Pounds under Pounds, Shillings under Shillings, and Pence under Pence, &c. with Distances between them; always observing, that the great Sum must be uppermost, as before in Sums of one Denomination. Then procede to take the under Sum out of the uppermost, begining at the least Denomination towards the Right Hand, as in *Addition*; and the same Respect must be had, when there is occasion to borrow as before in *Addition*, observing how many of the lesser Denomination makes one of the next greater, and borrow accordingly; remembring always to pay what you borrow to the next Denomination.

Example

I would subtract 247 *l.* 11 *s.* 9 *d.* $\frac{1}{2}$. *Disbursements*, from 372 *l.* 11 *s.* 6 *d.* $\frac{3}{4}$. *Received.* To do which, I set them down as before directed; and then they stand thus.

	l.	*s.*	*d.*	
Received	372	11	6 $\frac{3}{4}$	*Greater.*
Disbursem.	247	11	9 $\frac{1}{2}$	*Lesser.*
Remains	124	19	8 $\frac{3}{4}$	
Proof	372	11	6 $\frac{3}{4}$	

I begin

I begin at the least Denomination towards the Right Hand, *viz.* Farthings; saying, 2 from 1 I cannot, wherefore I borrow one from the next Name, which is Pence, one of which is 4 Farthings, but 2 from 4 and there remains 2, (which Remainder always add to the upper Number, or Figure you subtract from, for the more easy reckoning) and the 1 Farthing over it makes $\frac{3}{4}$, which I place under the Line, and go to the next Denomination of Pence, saying, 1 that I borrowed and 9 is 10, from 6 Pence I cannot, but I borrow one of the next, which is Shillings, one of which is 12 Pence; but 10 Pence from 12 Pence, and there remains 2, which I put to the Figure 6 I subtract from, and it makes 8, which I also put under the Line, in its proper place, and then I go to the next Denomination which is Shillings, saying, 1 that I borrowed, and 11 is 12, from 11 Shillings I cannot, wherefore I borrow one of the next, which is Pounds, (one of which is 20 Shillings) but 12 from 20 and there remains 8, and the 11 Shillings over it, which I subtract from, is 19, which I place under the Line, in its place; then going to the Pounds, I say, 1 that I borrowed, and 7 is 8, from 2 I cannot, (here I borrow 10, as in Sums of one Denomination) but 8 from 12 and there remains 4, then, 1 that I borrowed, and 4 is 5, from 7 and there remains 2; and lastly, 2 from 3 and there remains 1: And so the Sum is finished, and the Remainder or Difference, 124*l.* 13*s.* 8*d.* $\frac{3}{4}$, as by the *Example* may be seen.

Example 2.

A Collector of the *Excise* hath received 2479*l.* 12*s.* 6*d.* $\frac{3}{4}$, and paid into the Office by several Remittances, 1977*l.* 11*s.* 2*d.* How much remains in his Hands?

	l.	*s.*	*d.*
Received	2479	12	6 $\frac{3}{4}$
Paid	1977	11	2
Remains in his Hands	502	01	4 $\frac{3}{4}$
Proof	2479	12	6 $\frac{3}{4}$

Here

Here I begin and say, nothing from $\frac{3}{4}$, and there remains $\frac{3}{4}$; then 2 from 6, and there remains 4; and 11 from 12, and there remains 1; and then I go to the Pounds, saying, 7 from 9, and there remains 2; and 7 from 7, and there remains 0; and 9 from 4 I cannot, but 9 from 14, and there remains 5; and 1 that I borrowed and 1 is 2, from 2, and there remains 0; and so the Sum is done; and he hath remaining in his Hands, 502*l.* 01*s.* 4*d.* $\frac{3}{4}$, as by the said Work.

More Examples for Practice.

		(20)	(12)			(20)	(12)		(10)	(20)	(12)
	l.	*s.*	*d.*		*l.*	*s.*	*d.*		*l.*	*s.*	*d.*
From	7	10	1		5	00	0		77	00	7
Take	4	07	9		3	11	5		57	04	6
Rem.	3	02	4		1	08	7		19	16	1
Proof	7	10	1		5	00	0		77	00	7

	(20)	(12)	(4)	(10)	(20)	(12)	(4)		(20)	(12)
Dr.	7	11	1 $\frac{1}{2}$	476	10	9 $\frac{1}{4}$		7	00	0
Cr.	4	17	3 $\frac{1}{4}$	277	17	7 $\frac{1}{4}$		4	10	4 $\frac{3}{4}$
Bal.	2	13	10 $\frac{1}{4}$	198	13	2		2	09	7 $\frac{1}{4}$
Pr.	7	11	1 $\frac{1}{2}$	476	10	9 $\frac{1}{4}$		7	00	0

	(10)	(20)	(12)	(4)	(10)	(20)	(12)	
	l.	*s.*	*d.*	*q.*	*l.*	*s.*	*d.*	*q.*
Borrowed	419	02	10	$\frac{1}{4}$	7174	11	1	
Paid	197	03	10	$\frac{1}{2}$	2176	15	9	$\frac{1}{4}$
Rem. due	221	18	11	$\frac{3}{4}$	4997	15	3	$\frac{3}{4}$
Proof	419	02	10	$\frac{1}{4}$	7174	11	1	

When

When a Sum is borrowed, or a Debt paid, at ſeveral Times, then you muſt add the ſeveral Sums of Payment into one Total, and ſubtract that Total from the firſt lent, or otherwiſe due.

Example.

Suppoſe *A.* lends *B.* 70*l.* and *B.* hath paid *A.* at ſeveral Times, *viz.*

Lent, ———	*l.* 70	00	0
Paid at one Time, ———	24	10	0
Another Time, ———	7	11	6
Another, ———	20	00	0
Another, ———	4	10	6
Another, ———	1	01	6
Paid in all,	57	13	6
Remains due,	12	06	6
Proof,	70	00	0

To prove this, add the Sum paid in all, and the Sum reſting due, together; and if they make the Sum firſt lent, the Work is right.

	l.	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*
Lent,	7	10	0	560	10	9¼	1	01	6
Paid at ſeveral Times,	1	10	6	146	10	5	0	07	6
	0	11	9	17	15	0	0	01	6
	0	07	6	97	17	6	0	02	6
	2	10	6	76	00	0	0	01	6
	0	07	9	100	17	4	0	02	0
	1	10	0	100	01	7	0	01	0
Pd. in all	6	18	0	539	01	10	0	16	0
Rem.	0	12	0	21	08	11¼	0	05	6
Proof.	7	10	0	560	10	9¼	1	01	6

A familiar Example

	l.	*s.*	*d.*
Received of Mr. *East* ————————	59	06	0
pd. to Mr. *West* ————————	20	00	0
pd. to Mr. *No th* ————————	14	13	6
pd. to Mr. *South* ————————	15	12	0
Paid in all————	50	05	6
Remains in the Bag——	09	00	6

What Eight Sums of Pounds, Shillings, and Pence, and all different, will amount to just 50*l.*?

To do this you must observe the Directions given in *Page* 47. *Example* 7. for Sums of one Denomination; and see the following Work.

From	*l.* 50	00	0	the Sum assigned
The Seven Sums set down at random	4	17	6	
	5	01	6	
	1	01	6	
	7	11	4	
	6	04	2	
	9	03	9	
	8	13	5	
Subtract	42	13	2	
Remainder	7	06	10	The eighth Sum.

AVOIRDUPOIS-WEIGHT.

Here you are only to observe the Title of your Account, and borrow accordingly when there is Occasion.

Example 1

Example 1.

An *Ironmonger* buys 74 *Tuns*, 13 *C.* 2 *qrs.* 14 lb. of *Bilboa* Iron, and hath sold out of the said Parcel, 56 *Tuns*, 11 *C.* 1 *qr.* 20 lb. How much remains unsold?

I set down the Sum as before directed, that each Denomination may stand under that of the same kind, and draw a Line under them, as may be seen in the Margin.

(10)	(20)	(4)	(28)
Tuns.	*C.*	*qrs*	lb.
74	13	2	14
56	11	1	20
18	02	0	22
Proof 74	13	2	14

I begin at the Right-Hand, and say, 20 from 14 I cannot, but 20 from 28 (so many lb making a *qr.* of an Hundred, an Integer of the next Name) and there remains eight; which add to the 14, and they make 22, which I place under the Line; and go to the Quarters and say, 1 that I borrowed, and 1 is 2, from 2, and there remains 0; which I also set down, then 11 from 13 *C.* and there rests 2, which I likewise put down, and go to the Tuns, saying 6 from 4 I cannot, but 6 from 14, and there remains 8; then 1 that I borrowed, and 5 is 6, from 7, and there rests 1. And so the Work is done, and I find there remains unsold, 18 *Tuns*, 2 *C.* 0 *qrs.* 22 lb.

Example 2.

A *Grocer* buys 96 *C.* 2 *qrs.* 20 lb. of *Raisins*, and sells out again, 49 *C.* 3 *qrs.* 24 lb. what Quantity remains in his Hands?

	C.	*qrs.*	lb.	
Bought	96	2	20	*Greater Number.*
Sold	49	3	24	*Lesser Number.*
Remains in his Hands	46	2	24	
Proof	96	2	20	

Here I say, 24 from 20 I cannot, but 24 from 28, and there remains 4; and the 20 over it, makes 24, which I set down; then 1 that I borrow, and 3 is 4, from 2 I cannot, but 4 from 4, and their rests 0; but 2 that stands over it, is 2, which I set down; then 1 that I borrowed, and 6 is 7, from 6 I cannot, but 7 from 16, and their rests 9, and 1 that I borrowed, and 4 is 5, from 9, and there remains 4. So there remains in his Hands 46 *C.* 2 *qrs.* 24 ℔. and proved by *Addition*, by putting the Remainder and *Lesser* Sum together, and they make the *Greater*; and therefore the Work is right.

Example for Practice.

	(10) Tuns.	(20) C.	(4) qrs.	(28) ℔.	(10) C.	(4) qrs.	(28) ℔
Received,	700	11	1	17	756	3	24
Deduct.	421	04	2	20	327	1	25
Rem.	279	06	2	25	429	1	27
Proof.	700	11	1	17	756	1	24

C.	qrs.	℔.	C.	qrs.	℔	C.	qrs.	℔
4	0	12	24	1	12	9	0	00
3	1	07	19	2	24	5	3	15
0	3	05	04	2	16	3	0	13
4	0	12	24	1	12	9	0	00

Admit I have on board of a Ship from *Jamaica*, 94 *Tuns*, 13 *C.* 0 *qrs.* 00 ℔. of *Log Wood*, and have received by several Lighters, as follows, *viz.*

On

	(10)	(20)	(4)	(28)
	Tuns.	*C.*	*qrs.*	lb.
On Board, ————	94	13	0	00
By one Lighter————	12	11	3	09
Another————	19	14	0	21
Another————	17	12	2	24
Another————	15	14	3	06
Received,	65	13	2	04
Remains on board	28	19	1	24

	(10)	(4)	(28)		(10)	(4)	(28)
	C.	*qrs.*	lb.		*C.*	*qrs.*	lb.
Sugar bought,	49	3	12	*Currants,*	70	2	20
Sold at several Times	4	1	24		10	1	14
	9	2	17		7	2	14
	4	1	25		1	1	20
	7	3	20		12	1	19
	8	1	27		9	3	12
	9	2	20		10	0	00
Sold in all,	44	2	11		51	2	23
Rem. unsold,	5	1	01		18	3	25
Proof.	49	3	12		70	2	20

Avoirdupois small Weight.

	(10)	(16)	(16)	(10)	(16)	(16)
	lb.	*oz.*	*dr.*	lb.	*oz.*	*dr.*
Deliver'd,	4	10	14	46	13	10
Received,	2	09	9	27	15	14
Rem.	2	01	05	18	13	12
Proof.	4	10	14	46	13	10

	(10) lb.	(16) oz.	(16) dr.	(10) lb.	(16) oz.	(16) dr.
Delivered	55	00	00	79	15	14
Received	37	10	14	49	15	15
Rests due	17	05	02	29	15	15
Proof	55	00	00	79	15	14

Troy-Weight.

	(10) lb.	(12) oz.	(20) dwt.	(24) gr.	(10) oz.	(20) dwt.	(24) gr.
Received	24	09	14	12	756	12	15
Melted	19	07	15	20	478	11	22
Remains	05	01	18	16	278	00	17
Proof	24	09	14	12	756	12	15

	(10) lb.	(12) oz.	(20) dwt.	(24) gr.	(10) oz.	(20) dwt.	(24) gr.
Received	370	07	12	20	7420	15	20
Delivered	174	11	09	22	5789	18	15
Remains	195	08	02	22	1630	17	05
Proof	370	07	12	20	7420	15	20

Cloth-Measure.

	(10) *Yds.*	(4) *qrs.*	(4) *N.*	(10) *Ells Eng.*	(5) *qrs.*	(4) *N.*
Bought	54	2	2	420	3	2
Sold	27	2	3	247	4	3
Remains	26	3	3	172	3	3
Proof	54	2	2	420	3	2

I might give Examples in *Subtraction* of all the other Rules mentioned before in *Addition*, *viz.* of *Apothecaries* Weight, *Dry* and *Liquid Measure*, &c. but all of them being worked in the same Manner with those before, it is unnecessary.

CHAP. IV.

MULTIPLICATION.

I. IN this Rule there are always Two Numbers given to find out a Third, which will contain either of the given Numbers, as often as the other containeth Units.

II. This Rule also excellently and most concisely performeth the Work of *Addition*, either in simple or compound Numbers; as shall be illustrated and proved by sundry *Examples*, *Explications*, and *Improvements*, not hitherto treated of.

III. It likewise serveth to bring great Denominations into less, of the same Value; as *Pounds* into *Farthings*; and *Tuns Weight* into *Pounds Weight*, &c.

IV. *Multiplication* hath Three Parts, or Things, particularly to be noted, and known, *viz.*

1st, The *Multiplicand*, or *Number* to be *Multiplied*; and is generally the greatest of the two Numbers given.

2dly, The *Multiplier*, or *Number* by which you *Multiply*; and is generally the least of the two Numbers given.

3dly, The *Product*, or Result of the *Multiplication*; which is the Answer.

V. Before any Procedure can be made, the following *Table* must be got perfectly by Heart.

Multiplication-Table

2 times, or rather twice	2 is	4
	3	6
	4	8
	5	10
	6	12
	7	14
	8	16
	9	18
	10	20
	11	22
	12	24
3 times	3 is	9
	4	12
	5	15
	6	18
	7	21
	8	24
	9	27
	10	30
	11	33
	12	36
4 times	4 is	16
	5	20
	6	24
	7	28
	8	32
	9	36
	10	40
	11	44
	12	48
5 times	5 is	25
	6	30
	7	35
	8	40
5 times	9 is	45
	10	50
	11	55
	12	60
6 times	6 is	36
	7	42
	8	48
	9	54
	10	60
	11	66
	12	72
7 times	7 is	49
	8	56
	9	63
	10	70
	11	77
	12	84
8 times	8 is	64
	9	72
	10	80
	11	88
	12	96
9 times	9 is	81
	10	90
	11	99
	12	108
10 times	10 is	100
	11	110
	12	120
11 times	11 is	121
	12	132
12 times	12 is	144

The

The foregoing Table is ſo plain and eaſy, that it needs no Explanation; and therefore I ſhall proceed immediately to the Rule of Working.

VI. When any Number is given to be multiplied by another, ſet the biggeſt uppermoſt, which is the *Multiplicand*, and under that your *Multiplier*, in the ſame Order as in *Addition* and *Subtraction*, *viz.* Units under Units, Tens under Tens, &c. Then draw a line, and proceed, beginning at the Right Hand, and multiply every particular Figure of the *Multiplicand* by the *Multiplier*.

Example 1.

How much is 3 times	472	*Multiplicand?*
	3	*Multiplier.*
Anſw.	1416	*Product.*

Here I ſay, 3 times 2 is 6, which I put under the Line, as in the *Example*; then 3 times 7 is 21, I ſet down 1, and carry 2, for the two Tens, to the next; (as in *Addition* of one Denomination) then 3 times 4 is 12, and 2 that I carry is 14; ſo, becauſe it is the laſt Figure, I ſet down 14, and the Work is done, ſo I find that 3 times 472 is 1416, the *Product*, or Reſult of 472, multiply'd by 3.

If the ſaid 472 be three times ſet down, one under the other, and added together, the Total will be the ſame with the Product above; which ſhews, that *Multiplication* briefly performs the Work of *Addition*, (as was ſaid before) which is ſhewn in the Margin.

472
472
472
1416

Example 2.

How many makes 742 *Multiplicand*
Multiply'd by 4 *Multiplier*

2968 *Product*

Here I say, 4 times 2 is 8, which I set down under the Line; then 4 times 4 is 16; I set down 6, and carry 1 for the Ten to the next Figure; then 4 times 7 is 28, and 1 that I carry is 29; and it being the last, I set it down; so the Work is done, and I find the Product, or Answer, to be 2968, as above.

To prove the Work, multiply the *Multiplier* by the *Multiplicand*, and if the Product prove (as before) the same Figures, it is right. This is the quickest and best way of proving *Multiplication*, till *Division* be known.

I do not move the Sum to any other place, but let it stand as before multiply'd, and begin with the first Figure of the *Multiplicand*, towards the Right Hand, to multiply the *Multiplier*, saying twice 4 is 8, which I find to be right. Then to the next Figure, which is 4; and multiply the *Multiplier* by that, saying, 4 times 4 is 16, which is 6, and carry 1, which I also find right. Then to the next and last Figure in the *Multiplicand*, which is 7, and multiply the *Multiplier* 4 by that also, saying, 7 times 4 is 28, and 1 that I carried is 29, which I likewise find right: And so the Work is prov'd, and known to be truly wrought.

Example 3.

What is the Product of 90704 *Multiplicand*
Multiplied by 8 *Multiplier*

725632 *Product*

Here

Here I begin, saying, 8 times 4 is 32, I set down 2 and carry 3; then 8 times 0 is 0, but 3 that I carry is 3; then 8 times 7 is 56, I set down 6 and carry 5, then 8 times 0 is 0, but 5 that I carry is 5. Lastly) 8 times 9 is 72, which I set down, and the work is done; as by the Example above. And this is proved as before, by multiplying the *Multiplier* by the *Multiplicand*, saying 4 times 8 is 32, &c.

This way of Proof is also a Perfecting any one in the *Multiplication Table*; because the Digits, or Nine Figures, are multiply'd forwards and backwards: So that they may as readily answer, that 9 times 8 is 72, (not found in the Table, but reversely) as that 8 times 9 is the same.

More Examples for Practice.

Multiply	7460	Multiplicand
By	7	Multiplier
	52220	Product, or Ans.

How many are 9 times	365 ?
Or, how many Days in	9 Years ?
	3285

Multiplicand	432107	596432
Multiplier	5	6
Product	2160535	3578592

709543	675908	7654309
7	8	9
4966801	5407264	68888781

VII. When

VII. When the Multiplier consists of more Figures than One, then there must be as many several Products as there are Figures in the Multiplier, and placed under the Line, and added together, and the Total is the whole Product required. But observe always to place the first figure of each Product just under the Figure you multiply by, and so you move one Place towards the Left Hand for every Product, be as many as there will.

Example 1.

How much is 24 times	365	Multiplicand
or, How many Hours in a Year?	24	Multiplier
	1460	Product by 4
	730	Product by 2
	8760	Total Product.

The Numbers being placed in Order, as above, and according to the VIth *Rule* of this Chapter, after having drawn a Line under them, I begin with the first Figure in the Multiplier, *viz.* 4, saying, 4 times 5 is 20, I set down 0, and carry 2; then 4 times 6 is 24, and 2 I carry is 26, that is 6 and carry 2; then 4 times 3 is 12, and 2 is 14; and so I have done with the Figure 4. Then I go to the second Figure in the Multiplier, *viz.* 2, and multiply the Multiplicand 365, by that also, saying, twice 5 is 10, I set down 0, and carry 1, which 0 I set down just under the Figure 2, that I multiply by, and go a Place farther to the Left Hand, as was said before. Then I go on, saying, twice 6 is 12, and 1 I carry, is 13, that is 3, and carry 1, and twice 3 is 6, and 1 is 7; and so I have done with this Figure of the Multiplier also; and then I draw a Line under these two Products, and add them together, and they make 8760 for Answer. And so the Work is done, as may be seen in the *Example* above, and may be proved as before.

Example 2.

Example 2.

Let it be required to multiply	527537
By	285
	2637685
	4220296
	1055074
	150348045

A Line being drawn under the two Numbers, I proceed, saying, 5 times 7 is 35, &c. going thro' all the Figures of the Multiplicand by 5, and find its Product to be 2637685, then I go to the next Figure in the Multiplier, *viz.* 8, and multiply all the Figures of the Multiplicand by that also, and find the Product 4220296; then I multiply the Multiplicand by the last Figure, *viz.* 2, and the Product by that is 1055074. Then drawing a Line under these three Products, I add them together, and find their Total to be 150348045, for the true Product sought: That is, I find that 285 times 527537 amounts to 150348045; as by the Work above may be seen.

VIII. Whenever the Multiplier is such a Number, that any two Numbers of the Multiplication Table being multiplied together, make the said Multiplier; as in the foregoing Page, where the Multiplier is 24, and is made by multiplying 6 and 4 together. Then if you multiply the Multiplicand, by either of them Numbers, that is, either 6 or 4, and then multiply that Product by the other Number, the last Product shall be the Answer, and the same with the other Way.

Example.

365	Multiplied
4	
1460	
6	
8760	Product. And so of any other

There are, sometimes, Figures sav'd by this Method; and there is no Addition of Products.

More Examples.

4765	6796	476
14	17	19
19060	47572	4284
4765	6796	476
66710	115532	9044

56072592	275827
123	19725
168214776	1379135
112143184	551654
56071592	1930789
6896805816	2482443
	275827
	5440687575

How to prove Multiplication by the Cross.

The Common Way us'd in *Schools* is this: They make a *Cross* thus, X then add all the Figures in the Multiplicand together, as in *Addition*, and cast away the Nines, as oft as they arise, and bear the Remainder to the next Figure; and when they come to the End of the Line, they note what remains after the Nines are cast away, and set such Remainder on the left Side of the *Cross*; and then they do the same by the Multiplier, and note what remains there also, and set that on the Right of the *Cross*; then they multiply them two Figures together, and cast the Nines out of that Product, and set the Remainder on the Top of the *Cross*: Lastly, they cast away the Nines out of the Product, and if the Remainder be like the Figure on the Top of the *Cross*, they set it down at the Bottom, and conclude the Work right.

But this way of Proof is not infallible, as I have experienced many times: But this may be said for it, that if a Sum be done right, it will never appear to be wrong by this Way; but it many times makes a Sum appear right, when it is utterly false; and therefore not to be depended on as a certain *Proof*. I'll give one *Example* to make the foregoing Directions the more intelligible; which shall be one of the preceding Sums set down again here, *viz.* the Second foregoing.

3	56071592	Multiplicand
8 X 6	123	Multiplier
3	6896805816	Product

Here, after having made the *Cross*, thus; X
I begin at the Multiplicand, its no matter at which End; but I'll begin towards the Left Hand, saying 5 and 6 is 11, I cast away 9, and there rests 2; and 2 and 7 is 9, and there rests nothing; then 1 and 5 is 6, (I miss the 9) and 2 is 8, which I set on the Left of the *Cross*, as it appears in the

8 X

Mar-

8 X 6

Margin. Then going to the Multiplier, I say, 1 and 2 is 3, and 3 is 6, which I place on the Right. Then multiply one by the other, saying, 8 times 6 is 48, I cast away 5 Nines out of it, and there remains 3, which I put on the Top, as you see in the Margin. After the same Manner I cast away the Nines out of the Product, and at the last there remains three likewise; and so the Work is done.

```
  3
8 X 6
  3
```

☞ Note, *That the Figures on each Side of the* Cross, *being multiplied, make* 48, *and if you add them two Figures together, as they stand, and cast away the Nines, the Remainder will be the same; that is, instead of saying, how many Nines in* 48? *you say,* 8 *and* 4 *is* 12; *the Nines in* 12, *once, and there remains* 3, *as before.*

IX. The greatest Difficulty in Multiplication is, when there is a Cypher, or Cyphers intermixt with the Figures. In such Cases, only remember what was said before, in the VIIth *Rule*, to move for every Figure, or Cypher, one Place toward the Left Hand, and to take Care that each first Figure of the several Products stand directly under its respective Multiplier; an *Example* will make it easy to be understood.

Let it be required to multiply 50710984, by 4050607, having set the Numbers down as before directed, with a Line under them, they stand thus.

```
        50710984 Multiplica
         4050607 Multipli
        --------
       354976888
     3042659040
    2535549200
  2028439360
  --------------
  205410266767288
```

Here I begin, saying, 7 times 4 is 28, &c. and so go thro' the Multiplicand by 7, and find its Product 354976888; then I come to a Cypher, which I set down under the second Figure of the abovementioned Product, *viz.* 8, then I multiply the Multiplicand by the next Figure of the Multiplier, *viz.* (6 in the same Line) saying, 6 times 4 is 24; I set down 4 next to the Cypher, in the same Line, and it stands under the third Figure in the last Product, just under its Multiplier 6, and I find this Product, or Line, to be 3042659040. Then coming to another Cypher, I set it down just under its own Place, and go forward with the next Figure 5, in the same Line as before, saying, 5 times 4 is 20, &c. I set down the 0, just under 5 the Multiplier, and find this Product to be 2535549200. Then I come to another Cypher, and proceed as before, and find this last Line, or Product, 2028439360. All which Products being added together, make 20541026767288, for Answer. See the foregoing Work.

More Examples.

```
    7864371
      20604
-----------
   31457484
  471862260
 157287420
-----------
162037500084
```

```
   327586
     6030
---------
  9827580
 19655160
----------
1975343580
```

X. When there is a Cypher, or Cyphers, in the Multiplier towards the Right Hand, then set it, or them backward from the Place of Units, towards the Right Hand, and multiply by the significant Figure, or Figures, as usual; and afterwards annex the Cypher, or Cyphers, to the general Product, on the Right Hand, as in the following

Example

Examples.

326	4762	4796
20	70	400
6520	333340	1918400

746094	729764
3600	476000
4476564	4378584
2238282	5108348
	2919056
2685938400	347367664000

XI. When there are Cyphers both in the Multiplicand and Multiplyer, then omit the Cyphers in both, till you have multiplied by the significant Figures; and then join the Cyphers in each to the Product; as in these.

Examples.

42600	423000	376400
220	5600	2400
852	2538	15056
852	2115	7528
9372000	2368800000	903360000

CONTRACTIONS.

Or, how to multiply by 10, 100, 1000, 10000, &c.

To multiply by		Add to the Multiplicand
	10	0
	100	00
	1000	000
	10000	0000
	100000	00000

Example.

428 Multiply'd by		makes
	10	4280
	100	42800
	1000	428000
	10000	4280000
	100000	42800000

If you would be Expeditious and Dextrous in *Accompts* always so multiply by 11 and 12, that the Product may be in one Line only.

Examples.

Mult.	456	7890	3425
By	11	11	11
Prod.	5016	86790	37675

In the first of these, I say, 11 times 6 is 66, 6 and go 6; and 11 times 5 is 55, and 6 is 61, 1 and go 6; and 11 times 4 is 44, and 6 is 50, as above; and so of the rest.

Mult.	1234	56789	30762
By	12	12	12
Prod.	14808	681468	369144

Here I say, 12 times 4 is 48, 8 and carry 4; and 12 times 3 is 36, and 4 is 40, 0 and go 4, &c.

When any Number is to be multiplied by 5, it may be contracted by annexing a Cypher to the Number, and then halve it, because 5 is the $\frac{1}{2}$ of 10.

When

When you multiply by any of these compound Numbers, *viz.* 110, 120, 1100, or 1200, then multiply as before, and annex the Cyphers afterwards.

Example.

Mult.	3762	34567	46972	96790
By	110	120	1100	1200
Prod.	413820	4148040	51669200	116155200

Which Way of Multiplying is much better than the following.

Or thus.

3762	34567
110	120
37620	691340
3762	34567
413820	4148040

XII. To multiply by Article Numbers, *viz.* 13, 14, 15, &c. *a* 20, to have the Work in one Line.

Examples.

74974	45678
13	18
974662	822204

Or thus,

74974	45678
224922	365424
974662	822204

Rule

RULE for the first two Examples.

Multiply each Figure in the Multiplicand by the Unit Figure of the Multiplier, adding to each single Product its back Figure; and to the last Figure add what you carry.

As in the first Example, I say, 3 times 4 is 12, 2 and go 1; and 3 times 7 is 21, and 1 carried is 22, and 4, the back Figure of the Multiplicand, is 26, 6 and go 2; and 3 times 9 is 27, and 2 is 29, and 7, the back Figure, is 36, 6 and go 3; and 3 times 4 is 12, and 3 is 15, and 9, the back Figure, makes 24, 4 and carry 2; then 3 times 7 is 21, and 2 is 23, and 4, the back Figure, is 27; 7 and go 2, which 2 add to the last Figure 7, and it makes 9, as in the Work.

In the two last Examples, I multiply by the Unit Figure of the Multiplier, and set the first Figure of the Product one Place forward to the Right Hand, &c.

XIII. To multiply by a *mixt Number*; that is, a *whole Number* joined with a *Fraction*, whether it be $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{3}$, or $\frac{1}{5}$.

The RULE.

When you have multiply'd by the whole Number, take the $\frac{1}{4}$, the $\frac{1}{2}$, the $\frac{3}{4}$, the $\frac{1}{3}$, or the $\frac{1}{5}$, of the Multiplicand, and add it to the Product, and that Total shall be the whole Product, as in the following *Examples*.

Example 1.

In	276	Barrels of *Raisins*.
Each	$3\frac{1}{4}$	C. How many Hundred Weight?
	828	the Product by 3.
	69	the 4th Part of the Multiplicand, 276.
Answ.	897	Hundreds Weight in all.

Example

Example 2.

In 756 Pieces of *Stuffs*,
Each 24 ½ Yards, How many Yards?

3024
1512
378 the Half of the Multiplicand, 756.

Answ. 18522 Yards in all,

Example 3.

In 63 Fodder of Lead,
Each 19 ½ C. How many Hundreds?

567
63
31 ½ the Half of 63, the Multiplicand.

Answ. 1228 ½ Hundreds Weight in all.

If the Multiplier had been accounted Money, or 19*s.* 6*d.* and the Multiplicand 63 Integers, at that Price, then the Product would have been 1228*s.* 6*d.* or 61*l.* 8*s.* 6*d.*

Example 4.

In 24 Casks of *Tobacco*,
Each 2 ¾ C. How many Hundreds?

48
12 The Half of 24.
6 The 4th Part of 24, or Half of 12.

Answ. 66 Hundreds in all.

'Twould have been the same, if I had said 24 *pr.* of *Stockings*, or any thing else, at 2 *s.* ¾, or 2 *s.* 9 *d.* (for 9 *d.* is ¾ of a *Shilling*) then the Product would have been, 66 *s.* or 3 *l.* 6 *s.* *Ex-*

Example 5.

	224	*French* Crowns
At	54 $\frac{1}{3}$*d. per* Crown	
	896	
	1120	
	74 $\frac{2}{3}$.	The $\frac{1}{3}$ of 224, the Multiplicand.
Pence	12170 $\frac{2}{3}$.	

Example 6.

	340	Groſs of *Paſt-Boards*
At	7 $\frac{1}{5}$*d. pr.* Groſs, Cuſtom	
	2380	
	68	The $\frac{1}{5}$ Part of 340
Prod.	2448	*Pence.*

This Method of multiplying by a mixt Number, is of excellent uſe in a Multitude of Caſes, particularly in Exchange of Money of different Nations.

XIV. I ſhall now ſhew the excellent uſe of *Multiplication*, in anſwering all manner of Queſtions, that ordinarily occur in Buſineſs; where we have the *Price* of *one Thing*, and want to know the *Value* of *many Things* at that Rate; and ſhew that it performs the *Office*, and anſwers the *Work* of Queſtions in the *Rule of Three Direct*, of that Kind; but in a much conciſer Method, and more elegant Manner; and that by ſuch eaſy Rules and Directions, that any one, that underſtands *Addition of Money*, ſhall as readily caſt up any thing this Way, as he ſhall in a Sum in that: For nothing is more required here, than to carry from one Denomination to the next, exactly as we do there; and therefore it may be truly ſaid, That this *Rule* performeth the Work of many *Additions*, as was hinted before.

Example.

How much is 3 times Or 3 Yards of Cloth, at 11 *s.* 9 *d.*		*s.*	*d.*	
		11	9	*Multiplicand?*
			3	*Multiplier.*
	l. 1	15	3	*Prod. or Answ.*

The RULE.

Observe always to multiply the *Price* by the *Quantity*; and the *Product* is the *Answer.*

Here I say, 3 times 9 is 27 Pence, which is 2 *s.* and 3 *d.* I set down 3 *d.* under the Place of Pence, and carry the 2 *s.* to the Shillings; then 3 times 11 is 33, and 2 that I carry is 35 *s.* which is 1 *l.* 15 *s.* I set down the 15 *s.* under the Shillings Place, and set down the 1 Pound a little forward to the Left Hand; and so the Question is answered, and found to amount to 1 *l.* 15 *s.* 3 *d.* as by the Work above. Now here is no more difficulty than in *Addition*; it being the same in effect, and altogether as easy.

l.	*s.*	*d.*
	11	9
	11	9
	11	9
1	15	3

If 11 *s.* 9 *d.* is three times set down, as in *Addition*, and cast up, it will prove the same, as may be seen in the *Margin*: and is a sure Proof of the Truth of this Method.

Example 2.

How much is 5 times 7 *s.* 4 *d.*? Or, 5 Gallons of *Brandy*, at 7 *s.* 4 *d.*?

		s.	*d.*	
Multiplicand,		7	4	The Price.
Multiplier			5	The Quantity.
Product	1	16	8	Answer.

Here

Here I say, 5 times 4 is 20 Pence, which is 1 *s.* 8. I set down 8 and carry 1, just as in *Addition of Money*, (and nothing more is required to be remembred, let the *Example* be what it will) and 5 times 7 is 35 *s.* and 1 I carried is 36 *s.* which is 1 *l.* 16 *s.* I set down the 16 *s.* under the Place of Shillings, and the 1 *l.* towards the Left Hand, and the *Answer is* 1 *l.* 16 *s.* 8 *d.* as above.

Example 3.

What is 7 times 21 *d.*? Or, seven Stone of *Beef*,

	s.	*d.*	
At————	1	9	Price.
		7	Quantity.
	12	3	

Here I say, 7 times 9 is 63 *d.* that is 5 *s.* 3 *d.* set down 3, and carry 5, and 7 times 1 is 7, and 5 is 12; which makes 12 *s.* 3 *d.* for the Answer.

Example 4.

What comes 9 lb. of *Tea* to, at 9 *s.* 9 *d.* $\frac{1}{2}$ *per* Pound?

l.	*s.*	*d.*	*q.*
	9	9	$\frac{1}{2}$
			9
4	8	1	$\frac{1}{2}$

I say here, 9 times 2 is 18, 18 Farthings is 4 *d.* $\frac{1}{2}$, I set down $\frac{1}{2}$, and carry 4; then 9 times 9 is 81, and 4 I carry is 85 Pence, which is 7 *s.* 1 *d.* I set down 1, and carry 7; then 9 times 9 is 81, and 7 is 88 Shillings, which makes 4 *l.* 8 *s.* I set down 8 *s.* and the 4 *l.* out to the Left Hand, as before; and the *Answer* is 4 *l.* 8 *s.* 1 *d.* $\frac{1}{2}$ as above.

Example 5.

	l.	s.	d.	
What comes 10 times or 10 lb. of *Nutmegs*, at 11*s*. 6*d*.		11	6	to?
			10	
	5	15	0	

Here 10 times 6 is 60 Pence, which is just 5 *s*. I set down 0, and carry 5, then 10 times 11 is 110, and 5 is 115 Shillings, which is 5 *l*. 15 *s*. for the *Answer*.

Example 6.

		s.	d.
How much is 11 times Or 11 *Pistoles* at *ditto*?		17	6
			11
	l. 9	12	6

I say here, 11 times 6 is 66 Pence, which is 5 *s*. 6 *d*. I set down 6 and carry 5; then 11 times 7 is 77, and 5 that I carry is 82, I set down 2 and carry 8; then 11 times 1 is 11, and 8 is 19; and in regard they are so many *Angels* (it being in the Tens of Shillings) I take the Half of them, which is 9, or 9 Pounds, and Ten Shillings over, which I put to the Left of the 2 *s*. set down before, and they make 12 *s*. and the 9 *l*. I set at a proper Distance towards the Left Hand, as in the *Example* may be seen.

Example 7.

		s.	d.	
What comes 12 *Sheep* to, at		13	4	
			12	
	l. 8	00	00	*Answ*.

Now

Note, *'T's best to multiply the Shillings as simple Numbers, for every* 10 *carrying* 1, &c. *and then to halve the Tens of Shillings, which Half is always so many Pounds; and if they halve even, set down a Cypher in the Tens of Shillings Place; but if odd, then set down a* 1 *in that Place. Instances of both may be observed in the two last Sums.*

In the last Sum I said, 12 times 4 is 48 Pence, or 4 *s.* I set down 0, and carry 4; then 12 times 3 is 36, and 4 is 40; I set down 0, and carry 4 for 4 Tens; then 12 times 1 is 12, and 4 is 16, the Half of 16 is 8, which is 8 Pounds for *Answer*, as in the Work.

Some more Examples.

		l.	*s.*	*d.*
9 lb. of *Cinnamon*, at			7	2
				9
	Answ.	3	04	6
8 C. of *Sugar*, at			44	4
				8
Here the ½ of 35 is 17 and a ½.		17	14	8
12 Pair of *Stockings*, at	*pr. Pair*,		9	8
				12
	Answ.	5	16	0
7 C. of *Hops*, at		3	07	6
				7
	Answ.	23	12	6

		l.	*s.*	*d.*	*q.*
11 Ounces of *Silver*, at		0	5	5	$\frac{1}{2}$
					11
	Answ.	3	0	0	$\frac{1}{2}$
10 Pipes of *Wine*, at	*pr. Pipe,*	24	15	0	
				10	
	Answ.	247	10	0	
6 Yards of *Flannel*, at			1	2	
				6	
	Answ.		7	0	
9 C. of *Tallow*, at			34	6	
				9	
Here the $\frac{1}{2}$ of 31 is 15 and a $\frac{1}{2}$		15	10	6	

XV. When the Quantity exceeds 12, find two Numbers in the *Multiplication Table*, which being multiplied together, will make the Quantity: Then multiply the *Price* by one of the Numbers, (it matters not which you multiply first by) and then that Product by the other Number, and the last Product will be the Answer.

Example 1.

		l.	*s.*	*d.*	
What is 18 times Gallons of Brandy, at 4 *s.* 6 *d. per* Gallon.			4	6	Or 18
				3	the 1st Multiplier.
			13	6	the 1st Prod. by 3.
				6	the 2d Multiplier.
	Answ.	4	01	0	the last Prod. by 6.

Here

Here I find this Quantity hit two Ways (as many times it happens) *viz.* either by 3 and by 6, or by 2 and by 9; either of them multiplied together make the Quantity, *viz.* 18.

l.	*s.*	*d.*
	4	6
		2
	9	0
		9
4	1	0

Here is the Answer produced by 2 and 9, as above.

Example 2.

	l.	*s.*	*d.* *q.*
How much is 32 times Or, 32 lb. of *Tea*, at 15 *s.* 9 *d.* $\frac{1}{2}$ *pr.* Pound?		15	9 $\frac{1}{2}$
			4
The first Product by 4,	3	03	2
The second Multiplier,			8
Answer	25	05	4

Here the Numbers are 4 and 8; 4 times 8 making 32, the Quantity; wherefore I begin, and say, 4 times 2 is 8 Farthings, which being just Two-pence, I carry it to the Pence; then 4 times 9 is 36, and 2 is 38 Pence, which is 3 *s.* and 2 *d.* I set down 2, and carry 3 *s.* &c. After I have multiplied by 4, I find that Product to be 3 *l.* 3 *s.* 2 *d.* which I multiply by 8, the other Number, and find the last Product, or Answer, to be 25 *l.* 5 *s.* 4 *d.* as in the Work may be seen.

	l.	s.	d.
What is 120 times Or 120 Quarters of Corn, at 19 *s.* 8 *d. per* Quarter?		19	8
			10
	9	16	8
			12
Answ.	118	00	0

Here 10 times 12 makes 120 the Quantity; wherefore I multiply first by 10, and that Product is 9 *l.* 16 *s.* 8 *d.* which I multiply by the other Number 12, and that produces 118 *l.* for the Answer.

	l.	s.	d.
77 C. of *Madder* at	3	15	6
			7
	26	08	6
			11
Answ.	290	13	6

Here 11 times 7 makes the Quantity; when I come to multiply by the second Multiplier, *viz.* 11, I say 11 times 6 is 66, which is 5 *s.* 6 *d.* I set down 6, and carry 5; then 11 times 8 is 88, and 5 is 93 *s.* which is 4 *l.* 13 *s.* I set down 13 and carry 4; then 11 times 6 is 66, and 4 is 70, I set 0, and carry 7 for the seven Tens; then 11 times 2 is 22, and 7 is 29, &c.

More Examples.

	l.	s.	d.
15 Yards of *Ribbon*, at		2	1
			6
		6	3
			5
Here 3 times 5 is 15, the Quantity. Anf.	1	11	3

21 Yards

	l.	s.	d.
21 Yards of *Tabby*, at		5	11
			7
Here 7 times 3 is 21 the Quantity.	2	01	5
			3
Answ.	6	04	3

	l.	s.	d.
72 Gallons of *Wine*, at		5	4
			6
Here 6 times 12 makes the Quantity, or 8 times 9 makes 72 likewise.	1	12	0
			12
Answ.	19	04	0

	l.	s.	d.	q.
81 ℔ of *Nutmegs*, at		12	3	$\frac{3}{4}$
				9
Here 9 times 9 makes the Quantity.	5	10	9	$\frac{3}{4}$
				9
Answ.	49	17	3	$\frac{3}{4}$

XVI. When the Quantity is such a Number, that no two Numbers in the Table can be found to answer it, then multiply by two such Numbers as come nearest to the Number given, as before; and for the Number wanting, to make up the Number given, multiply the Price of one by the Number that is wanting, and add it to the other Product, and the Total will be the Answer.

Example 1.

		l.	*s.*	*d.*
39 C. of *Currants*, at	*pr.* C.	2	13	6
				6
		16	01	0
				6
		96	06	0
The Price 2 *l.* 13 *s.* 6 *d.* multiplied by 3.		8	00	6
	Answ.	104	06	6

Here I find the two Numbers that come the nearest, are 6 times 6, by which I multiply as before, and the last Product is 96 *l.* 6 *s.* 0 *d.*; but 6 times 6 is but 36, and the Quantity is 39, so that there is 3 C. wanting; wherefore I multiply the Price 2 *l.* 13 *s.* 6 *d.* by 3, and it produces 8 *l.* 00 *s.* 6 *d.* to be added to the last Product, 96 *l.* 06 *s.* 0 *d.* which together make 104 *l.* 06 *s.* 6 *d.* for the Answer.

		l.	*s.*	*d.*
79 Firkins of *Butter*, at		00	17	6
				7
		06	02	6
				11
Here the two Numbers that come nearest, are 7 times 11, which is 77.		67	07	6
The Price multiplied by (2) that are wanting,		01	15	0
	Answ.	69	02	6

More

More Examples.

		l.	*s.*	*d.*
57 Groſs of Pipes, at	*per Groſs.*		1	4
				7
			09	4
				8
		03	14	8
1 Groſs wanting,		00	01	4
	Anſw.	03	16	0

		l.	*s.*	*d*	*q.*
79 C. ¾ of *Ship-Bisket*, at			13	6	
				6	
		4	01	0	
				12	
		48	12	0	
The Price multiplied by 4.		02	14	0	
The ½ of 13 *s.* 6 *d.* for the ½ C.		00	6	9	
The ¼ of *ditto*, for the ¼ C.		00	03	4 ½	
	Anſw.	51	16	1 ½	

		l.	*s.*	*d.*
87 Ells of *Holland*, at			3	5 ½
Here 7 times 12 is 84, and 3 is 87				7
		1	04	2 ½
				12
		14	10	6
The Price multiplied by 3.			10	4 ½
	Anſw.	15	00	10 ½

If I had multiplied by 11 times 8, which is 88, and ſubtracted the Price of 1 from the Product, the Remainder would have been the Anſwer, as before.

		l.	s.	d.
97 C $\frac{1}{2}$ of *Cheeſe*, at	*per C*		25	6
				8
		10	04	0
				12
		122	08	0
For the 1 C. wanting		1	05	6
The Half of the Price for the Half C.			12	9
	Anſw.	124	06	3

Thus by the various *Examples* foregoing, is manifeſtly ſeen, That when the Price of one Thing is given, the Price of many (at the ſame Rate) may be found by *Multiplication* only; and ſooner, and much handſomer than by the *Rule of Three.*

Large Sums may be caſt up this Way, as well as ſmall, obſerving the Directions following.

When your Sum is 1, 2, 3, 4, or more Hundreds, always multiply the Price by 10, and then that Product by 10 alſo, which produces the Value of one Hundred; then multiply that Product by the Number of Hundreds, whether 2, 3, 4, or 5, &c. and that Product is the Value of ſo many Hundreds as there are; then for the Tens, whether 20, 30, 40, &c. multiply that Product which gives the Price of 10, either by 2, 3, 4 or 5, as the Tens ſhall happen, which place under the laſt Product, without drawing a Line; and for the Units always multiply the Price by them, whether 2, 3, 4, &c. and ſet that alſo juſt under the former Products, ſo that you will have three Lines to add together, and the Total of them is always the Anſwer. An *Example*, or two, will make it eaſy to be underſtood.

Example

Example 1.

	l.	*s.*	*d.*	
What is 648 times		4	6	
Or 648 lb. of *Indigo*, at *ditto*?			10	
The Value of (10)	2	05	0	
			10	
The Value of (100)	22	10	0	
The Number of Hundreds			6	
The Value of (600)	135	00	0	600
The Price of (10) mult. by (4)	9	00	0	40
The Price mult. by (8)	1	16	0	8
Answ.	145	16	0	648

First I multiply 4 *s.* 6 *d.* the Price, by 10, and that produces 2 *l.* 5 *s.* for the Price of 10; also I multiply the said 2 *l.* 5 *s.* the Price of 10, by 10 again, and that produces 22 *l.* 10 *s.* for the Value of 100; then I multiply the Value of 100, by 6, the Number of Hundreds; and that Product is the Value of 600, being 135 *l.* 00 *s.* 00 *d.* wherefore I am only now to find out the Value of 48: For the four Tens in 48, I multiply the Price of 10, *viz. l.* 2 : 05 : 0, by 4, and that Product shews the Value of 40, which is 9 *l.* Then for the 8 Units in the 48, I multiply the first Price, *viz.* 4 *s.* 6 *d.* and that Product gives the Value of 8, which is 1 *l.* 16 *s.* All which being added together, (that is, only the three Lines that have no Line of Separation between them) make 145 *l.* 16 *s.* 0 *d.* for Answer.

And thus may any Sum be done; let it be as large as it will; only when the Sum consists of Thousands, you have 4 Lines to add together, but when but of Hundreds, then but three.

Example

Example. 2.

	l.	s.	d.	
355 Ells of *Holland*, at		2	3 ½	
			10	
The Value of (10)	1	02	11	
			10	
The Value of (100)	11	09	2	
			3	
The Value of (300)	34	07	6	300
The Value of 10 mult. by (5)	5	14	7	50
The Price by 5 Units	0	11	5 ½	5
Answ.	40	13	6 ½	355

Example 3.

	l.	s.	d.	
966 lb of *Bohea Tea*, at		14	5	
			10	
The Value of (10)	7	04	2	
			10	
Ditto of (100)	72	01	8	
The Number of Hundreds			9	
The Value of (900)	648	15	0	900
The Value of 10 mult. by (6)	43	05	0	60
The Price of 1 mult. by (6)	4	06	6	6
Answ.	696	06	6	966

Example

Example 4.

	l.	s.	d.	
8954 Gall. of *Rum*, at		03	5	
			10	
The Price of (10)	1	14	2	
			10	
The Price of (100)	17	01	8	
			10	
The Price of (1000)	170	16	8	
The Number of Thousands			8	
The Value of 8000	1366	13	4	8000
The Value of (100) m. by 9,	153	15	0	900
The Value of (10) m. by 5,	8	10	10	50
The Price mult. by 4 Units	0	13	8	4
Answ.	1529	12	10	8954

I have insisted the longer on this excellent Method, that it might be well understood; not only for its elegant, expeditious, and facile Dispatch of ordinary Affairs; but for its Utility in contracting many Operations in other Rules, as the *Rule of Three*, &c.

I know it is not not customary to introduce any thing of this Kind to be learnt so early; imagining (it may be) the Scholar not capable of understanding them, 'till he has made farther Advances in *Arithmetick*; but since they are only *Multiplication*, the foregoing Methods properly belong to the *Rule*, and may well be taught in it, especially since they are of such excellent use in all Manner of Business; and may be of Service to some, whose Leisure or Ability admit not of larger Improvements in *Arithmetick*.

Quan-

Quantities of Weight, Meafure, &c. are expeditioufly found by this Method of multiplying by Component Parts.

Examples.

In 64 Barrels of *Anchovies*, each	30 $\frac{1}{2}$ lb.
how many Pounds? Multiply by	8 and 8
	Anfw. 1952
In 56 Firkins of Butter, each	56 lb.
how many Pounds? Multiply by	7 and 8.
	Anfw. 3136
	C. qrs lb.
In 98 Casks of Capers, each	3 3 14
how many Hundreds, &c.?	10, 9, and 8
	Anfw. 379 3 0
In 104 Bars of *Spanish Silver*, each	46 $\frac{1}{4}$ Oz.
how many oz.?	10, 10 and 4
	Anfw. 4810 Ounces
In 48 Packs of *Linnen*, each	4225 Ells Fl.
how many Ells *Flemish*? Mult. by	6 and 8.
	Anfw. 202800

I might here alfo fhew the Method of *Crofs Multiplication*; or multiplying *Shillings* and *Pence*, by *Shillings* and *Pence*; or *Feet* and *Inches*, by *Feet* and *Inches*; (it being all one) and fome other Methods in *Practical Multiplication*; but there being too much of *Divifion* ufed with them, I fhall defer them till I come to another Place.

CHAP.

CHAP. V.

DIVISION.

I. IS a *Rule*, by which we difcover how often one Number is contained in another; as if it were asked, How often is 8 contained in 48; The Anfwer would be 6 times. It likewife ferveth to bring fmall Denominations into greater; as *Farthings* into *Pounds*, and *Pounds Weight* into *Tuns Weight*, &c.

II. This *Rule* is comprehended under Three certain Branches, and One uncertain, *viz.*

1. The *Dividend*, or Number given to be divided.
2. The *Divifor* or Number given to divide by.
3. The *Quotient*, or Number of equal Parts, fhewing how often the *Divifor* is contained in the *Dividend*.
4. The *Remainder*, after the Work is ended; which is always of the fame Name or Quality with the *Dividend*; and muft be lefs than the *Divifor*, if the Work be right: And this is the uncertain Branch, becaufe there is fometimes a *Remainder*, and fometimes not.

III. *Divifion* is either Single or Compound. Single, when the *Divifor* confifteth of one Figure only, and the *Dividend* of two at the leaft: Any thing of this Kind is anfwered by the *Multiplication Table*; as if 54 were to be divided by 6, the Anfwer would be 9; for 6 is contained 9 times in 54; Here 54 is the *Dividend*, 6 the *Divifor*, and 9 is the *Quotient*, or Anfwer.

IV. *Compound Division* is when the *Dividend* consisteth of many Places or Figures, and the *Divisor* of one or more Figures. As if 365, the Days in a Year, were to be divided by 7, the Days in a Week; 365 is the *Dividend*, 7 is the *Divisor*, 52 the *Quotient*, and 1 the *Remainder*.

```
            Dividend.
Divisor 7 ) 365 ( 52 Quotient
            35
            ---
             15
             14
            ---
            (1) Remainder
```

A General Rule for the Working.

N. B. { 1 *Seek*, 2 *Multiply*, 3 *Subtract*. }

This *Rule* comprehends Three of those foregoing; and is accounted the hardest Lesson of *Arithmetick*; but I shall, by plain *Rules*, and familiar *Examples*, render it easy to the meanest Capacity. And as in *Multiplication*, so in this *Rule*, I shall endeavour at some new Improvements; discovering that many Things in this *Rule* may be abridged, and shew its excellent Use in answering many Questions, which seem to require a more progressive Knowledge in *Arithmetick*.

Example 1.

Let it be required to divide 7420 by 5; in order to which, I place my *Dividend*, or Sum to be divided, into 5 equal Parts, or Shares, thus, 7 4 2 0. Then I place my *Divisor* 5, before the *Dividend*, with a crooked Line before it, and a strait Line drawn underneath it thus;

```
5)7420
------
```

Then

Then I proceed according to the *Rule*: And first I *seek*, saying, How many times 5, the *Divisor* can I have in 7, the first Figure of the *Dividend*, and the Answer is once, which 1 I place under the Line just under the 7; then, according to the *Rule*, I multiply, saying, once 5, (the *Divisor*) is 5; then, as the *Rule* directs, I subtract, saying, 5 from 7, and there remains 2, which are 2 Tens, which I suppose to stand before the next Figure in the *Dividend*, *viz.* 4, and so makes it 24,

5)7420

for a new *Dividual*. Then again I *seek*, saying, How many times 5, the *Divisor* can I have in 24, the *Dividual*? And the Answer is 4 times, which I place under the Line, just under 4 the second Figure, in the *Dividend*, then I multiply, saying, 4 times 5, the *Divisor*, is 20, which I subtract from 24, and there rests 4, which being 4 Tens, makes the next Figure 2, in the *Dividend*, to be 42. Then again I seek how many times 5 I can have in 42, and the Answer is 8 times, which I put under the Line, just under 2, the third Figure in the *Dividend*; then I multiply saying, 8 times 5 is 40, which I subtract from 42, and there remains 2, which 2 Tens make the Cypher in the *Dividend* to be 20; then I say, how many times 5, the *Divisor*, in 20, and the Answer is 4 times; then 4 times 5, the *Divisor*, is 20, from 20, and there remains nothing. And so the Work is done; as by the following *Example*.

Divisor 5)7420(*Dividend.*

1484 *Quotient*, or Answer.

So that I find by the Work, that 5 is contain'd in 7420 just 1484 times: Or if the *Dividend* had been so many *Shillings* or *Pounds*, to be parted among 5 Persons, each Person must have had so many *Shillings*, or *Pounds*, for his Share.

V. When

V. When the first Figure of your *Dividend* is lesser than the *Divisor*, or first Figure of your *Divisor*, then make the two first Figures of the *Dividend*, your *Dividual*, and work as before.

Example.

Divide 4263 Gallons of *Wine* among 7 Persons: Having set down the *Dividend* for the Work as before, with the *Divisor* before it, thus,

7)4263(*Dividend.*

609 *Quotient.*

I proceed, saying, How many times 7, the *Divisor*, can I have in 4, the first Figure of the *Dividend*; and knowing I cannot take 7 out of 4, I take it out of 42, the two first Figures of the *Dividend*, and the Answer is 6 times, which I put just under 2, the second Figure of the *Dividend*, and then multiply, saying, 6 times 7, the *Divisor*, is 42, from 42, and there remains nothing. Then the Sevens that are in 6 (for you must never take more than one Figure, or Cypher, at a time out of the *Dividend*, except you are obliged to do it at first) I cannot take, wherefore I put a Cypher in the *Quotient*, under 6, and the 6 remains as so many Tens, and makes the next or last Figure in the *Dividend* 3, to be 63; then the Sevens in 63, 9 times, and the Work is done; and the *Quotient* is 609, or 609 Gallons for each Man's Share.

The Proof.

To prove this, or any other Sum in *Division*, multiply the *Quotient* by the *Divisor*, and if the *Product* is like the *Dividend*, the Work is right: But observe, whenever there is a *Remainder*, such *Remainder* must be taken in, or added to the *Product*.

Example.

Example.

$$
\begin{array}{r}
7)4263 \\
\hline
609 \\
7 \\
\hline
4263 \text{ \textit{Proof.}} \\
\hline
\end{array}
$$

Here I say, 7 times 9 is 63, 3 and carry 6, then 7 times 0 is nothing, but 6 is 6; lastly, 7 times 6 is 42; so that I find this *Product* to be the very same Figures with the *Dividend*; therefore the Work is right.

So likewise as *Multiplication* proves *Division*, doth *Division* prove *Multiplication*. For if you divide the *Product* by the *Multiplier*, the *Quotient* (if the Work is right) will be the same with the *Multiplicand*: As thus:

In proving the last Sum, 609 is the *Multiplicand*, and 4263 is the *Product*, and 7 the *Multiplier*. Now if the *Product* 4263 be divided by 7 the *Multiplier*, the *Quotient* will be 609 the *Multiplicand*, as may be seen in the foregoing Work.

Example.

Divide 97961 Pieces $\frac{1}{2}$ among 9 Men.

$$
\begin{array}{r}
9)97961 \\
\hline
10884\,\tfrac{5}{9} \text{ \textit{Answer.}} \\
9 \\
\hline
97961 \text{ \textit{Proof.}} \\
\hline
\end{array}
$$

Here

Here I say, the Nines in 9, once; which I put under the Line, just under 9 in the *Dividend*, and then I multiply, saying, once 9 from 9, and there remains nothing; then the Nines in 7, none; wherefore I set down a 0, in the *Quotient*, just under 7, and the 7 remains, and makes the next Figure 9 in the *Dividend*, to be 79; then the Nines in 79, are 8, then 8 times 9 is 72, from 79, and there rests 7, which makes the next Figure 6, in the *Dividend*, to be 76; then the Nines in 76 are 8; 8 times 9 is 72, from 76, and there rests 4, which makes the next and last Figure in the *Dividend* to be 41? then the Nines in 41 are 4; 4 times 9 is 36, from 41, and there rests 5, which is the *Remainder*; which may be set at some small Distance from the *Quotient*, towards the Right-hand, with the *Divisor* 9 under it, thus, $\frac{5}{9}$. So that there are 5 *Pieces* $\frac{8}{8}$ over, besides 10884, that comes to each Man's Share and is called a *Fraction*, and signifies, that each Person ought to have 5 Ninths of a *Piece of Eight* more to his Share.

What hath been already said for Instruction, to divide by a single Figure, I think sufficient to any intelligent Person; and therefore shall only add some *Examples* for the Learner's Practice, and so proceed forward in the Rule.

Examples for Practice.

	Divid.		
Divisor	6)9654	7)4702	5)44044
Quot.	1609	671 $\frac{5}{7}$	8808 $\frac{4}{5}$ *Rem.*
	4)57902	9)345678	6)407060
	14475 $\frac{2}{4}$	38408 $\frac{6}{9}$	67843 $\frac{2}{6}$

Divisor

Divisor	7)89012	8)98765	9)4567097
Quot.	12716	12345 $\frac{5}{8}$	507455 $\frac{2}{9}$
	7	8	9
Proof.	89012	98765	4567097

Note, *There can be no shorter Way, nor a more regular Method of dividing by a single Figure, than by the* Examples *foregoing.*

As in *Multiplication*, we multiply by 11 and 12 at once, to have the Product in one Line, so in this Rule 'tis most expeditious and commendable to divide by the abovementioned Numbers, as by a single Figure, as in the following *Examples.*

By	11)45678	11)379600
Quotient	4152 $\frac{6}{11}$	34509 $\frac{1}{11}$
By	12)42697	12)3967040
Quotient	3558 $\frac{1}{12}$	330586 $\frac{8}{12}$
	12	12
Proof.	42697	3967040

In the first *Example* I say, The Elevens in 45, 4 times; the Elevens in 16, once; the Elevens in 57, 5 times; the Elevens in 28, twice, and there remains 6; and the *Quotient* is 4152; as by the *Example.*

In the third *Example*, where I divide by 12, I say the Twelves in 42, 3 times; the Twelves in 66, 5 times; the Twelves in 97, 8 times, and there remains 1; and the *Quotient* is 3558; as by *Example.*

In

In like Manner may you divide by these Numbers, *viz.* 110, 120, 1100, or 1200, &c. cutting off the Cypher, or Cyphers, with a downright Stroke of the Pen; and also as many Figures, or Cyphers, towards the Right Hand, in the *Dividend*, which will be the Remainder, or Part of it; as in the following

Examples.

Divide by	11|0)8097|4	12|00)2880|00
Quotient	736 $\frac{14}{110}$	240
	110	
Proof	80974	

VI. *Contractions*, or how to divide by 10, 100, 1000, or 10000, &c. So many Cyphers as you have in your *Divisor*, cut off with a Stroke so many Figures, or Cyphers, from your *Dividend*, from the Right Hand towards the Left; and the Work is done. The Figures on the Left Hand of the Stroke is the *Quotient*; and those on the Right the *Remainder*: as in these *Examples*.

Q. R.	Q. R.	Q. R.
1|0)3.6|5	1|00)749|60	1|000)567|890
10	100	1000

Quot.
1|0000)7496|4600 Remains.

VII. When the *Divisor* consists of several Figures, then arises the greatest Difficulty in the Work of *Division*; but I shall give such plain Directions, which, if heedfully attended, and observed, will render it very easy.

Example I.

Example 1.

Let it be requir'd to divide 78901 by 32. In order to the Work, I place the Numbers down with two crooked Lines, one *behind* the *Divisor*, and the other before the *Quotient*; thus:

Divid. Quotient.
Divisor 32)78901(. . . . .

Thus I set out as many Figures towards the Left Hand of the *Dividend*, as there are Places in the *Divisor*, by making a *Point* under 8, as above: then remembring the *General Rule*, viz. to *Seek*, *Multiply*, and *Subtract*, I begin, saying, how many times 3, the first Figure of the *Divisor*, can I have in 7, the first Figure in the *Dividend*, and the Answer is twice; wherefore I set down 2 in the *Quotient*, thus, 32)78901(2. Then according to Rule, I multiply the *Divisor* 32, by 2, the times I take, saying, twice 2 is 4, which I set down under 8 in the *Dividend*; then twice 3 is 6, which I place under 7 in the *Dividend*; then I draw a Line, and, according to Rule, subtract 64 from 78, and there remains 14; as in the first Step of the Work may be seen, standing thus:

```
32)78901(2
   64
   --
   14
```

Then I make a *Point* under the next Figure, to wit, 9, and bring it down, setting it on the Right Hand of the *Remainder* 14; and then there is 149 for a new *Dividend*, and stands thus;

32)78901(2
$\cdot\cdot$
64
———
149

Then again I seek how oft I can have 32, the *Divisor*, in 149 the *Dividual*; but since that is too hard to reach by the Mind, there being one more Figure in the *Dividual* than in the *Divisor* (for there never ought to be more than one) I seek how often I can have 3, the first Figure of the *Divisor*, in 14, the two first Figures in the *Dividual*, and I find I can have 4 times; wherefore I put 4 in the *Quotient*, and multiply the *Divisor* 32, by 4, the Figure placed in the *Quotient*, saying, 4 times 2 is 8, which I set under 9; then 4 times 3 is 12, which I put under 14, and then subtract 128 from 149, and there remains 21; (*Note*, After any *Subtraction*, there must never remain so much as the *Divisor*, for if there doth, you have made an Error, by taking a Time too little, which must be rectified before you proceed any further); then I make a Point under the next Place in the *Dividend*, which is a Cypher, and bringing it down, set it on the right of the Remainder 21, and it makes 210, for a *Dividend*; and after this second Step, the Work stands thus;

32)78901(24
$\cdot\cdot\cdot$
64
———
149
128
———
210

Then again I seek how oft I can have 32 the *Divisor* in 210, or how oft, (because there is one Figure more in the *Dividual*, than in the *Divisor*) I can have 3, the first in the

the Divisor, out of 21, the two first Figures in the Dividual, and the Answer is 7 times: But I must observe, not to take the first Figure any more times than I can the next. Wherefore I try if I can take all the Figures 7 times, by multiplying 32 the Divisor, by 7, and note its Product on Paper, or in my Mind, only by observing the two last Figures, whether it be not too big to subtract from the Dividual, and I find it is, for I cannot take 224 (the Product of 32 by 7) out of 210 the Dividual, wherefore I take a time less, *viz.* but 6, and put that in the Quotient, and say, 6 times 2 is 12, 2 and carry 1, and 6 times 3 is 18, and 1 is 19, and then I have 192 to take out of 210, and there rests 18. Then I make a Point under the last Figure of the Dividend, 1, and bring it down to the Remainder 18, and it makes 181, and the Work stands thus;

```
32)78901(246
    ....
   64
   --
   149
   128
   ---
    210
    192
    ---
     181
```

Then I seek how often I can have 32 out of 181, or how oft 3 in 18, and the Answer is 6 times; but on trial I find that too much; and therefore I take but 5 times, and set 5 in the Quotient, and multiply the Divisor 32 by 5, and find that Product is 160, to be subtracted from 181, and the Remainder is 21, and so the Work is finished, and the Quotient is 2465, and the Remainder 21; which shews that 32 is contained in 78901, 2465 times, and 21 over. *See the Work.*

Dividend.
Divisor, 32)78901(2465 *Quotient.*

```
        64
       ----
       149
       128
       ----
        210
        192
       ----
        181
        160
       ----
        (21) Remainder.
```

Example 2.

Divide 16790 Days by 365.

Quotient.
365)16790(46 Years.

```
   1460
   ----
   2190
   2190
   ----
    (0)
```

In the *Example* above, I find I cannot take the first Figure of the *Divisor* out of the *Dividend*; wherefore I say, How oft 3 in 16? Upon Trial, I find 5 times too much, wherefore I set 4 in the *Quotient*, and say, 4 times 5 is 20, I set down 0 under 9, in the *Dividend*, and carry 2 saying, 4 times 6 is 24, and 2 is 26, 6 and carry 2; then 4 times 3 is 12, and 2 is 14; which Product of 1460 I subtract out of the *Dividual* 1679, and there remains 219, to which I bring down the Cypher out of the *Dividend*, and it makes 2190 for a *Dividual*, &c. *See the Work above.*

Example 3.

Example 3.

Divide 345678901 by 2345. In order to the Work, I set it down thus;

2345)345678901(

In this Sum are four Places in the Divisor, wherefore I make a Point under the 4th Figure in the Dividend, *viz.* under 6, for my first Dividual; but if the first Figure in the Divisor had been bigger than the first in the Dividend, then I must have made the Point under the 5th Figure in the Dividend, to wit, under the 7; and then have tried how oft the first Figure in the Divisor could have been taken out of the two first Figures in the Dividend.

But to proceed, I first seek how oft I can have 2, the first of the Divisor, out of 3, the first Figure of the Dividend, which is once, wherefore I put one in the Quotient, and multiply the Divisor 2345 by 1 setting the Product just under the first Dividual, and subtract according to Rule, and then the Work stands thus:

2345)345678901(1

2345

1111

Note, *You must never bring down more than one Figure or Cypher at a Time out of the* Dividend, *and for every Figure or Cypher brought down, there must be one, or a Cypher put in the* Quotient.

Then I make a *Point* under the next Figure in the Dividend, *viz.* 7, and bring it down, placing it on the Right of the Remainder 1111, and then I have 11117 for a Dividual, which contains one Figure more then the Divisor; wherefore I take the first Figure of the Divisor

out of the two first Figures of the Dividual, *viz.* 2 out of 11, saying, the Two's in 11, 5 Times; but on tryal, I find I cannot take five times thro' the whole Divisor; for when I multiply the Divisor by 5, I find its Product to be 11725, which cannot be taken out of 11117, that is, I cannot take 117 out of 111, wherefore I take one less, and set 4 in the Quotient, by which I multiply the Divisor 2345, and find its Product 9380, which subtracted from 11117, leaves 1737 for the Remainder; to which I bring down the next Figure of the Dividend, *viz.* 8, and annex it on the Right Hand, and then there is 17378 for a Dividual, and the Work stands thus;

```
2345)345678901(14
         ....
     2345
     ----
     11117
      9380
     -----
     17378
```

Then I seek how oft I can have 2 in 17, and the Answer is 8 times, but on tryal I find it too much; wherefore I set 7 in the Quotient.

Note in general, *When you are upon Tryal for the Times you can take, you need only mind the two last Figures of the Product towards the left Hand; for if you can take them out of the two first of the Dividual, it will most commonly bear the Times you take.*

Having set 7 in the Quotient, I multiply the Divisor by it, and the Product is 16415, which I subtract from 17378, and the Remaieder is 963; to which I bring down the next Figure in the Dividend, *viz.* 9, and then I have 9639 for a Dividual, and then the Work will appear as follows.

2345)

2345)345678901(147

2345

11117
 9380

17378
16415

9639

Here this last Dividual hath an equal Number of Figures with the Divisor, *viz.* Four; wherefore I seek how often I have 2, the first Figure of the Divisor, out of 9, the first of the Dividual, and the Answer is 4 times, which I put in the Quotient, and then multiply the Divisor by it, and the Product is 9380, which subtracted from 9639, the Remainder is 259, to which I bring down the Cypher, the next Place in the Dividend, and then I have 2590 for a Dividual; then I seek again, and set 1 in the Quotient, by which I multiply the Divisor, and subtract according to Rule, the Remainder is 245, to which I bring down the last Figure out of the Dividend, *viz.* 1, and then there is 2451 for the last Dividual, and then I seek again, and I find I can take but once, wherefore I set another 1 in the Quotient, and work as before; and I find the Remainder 106, and so the Work is finished, as by the whole Operation in the following Page.

The Proof.

To prove the following Sum, or any other Sum in this *Rule*, multiply the Quotient by the Divisor, and if there be a Remainder, it must be taken in as you multiply; and if the Product is like the Dividend, the Work is right, as may also be seen in the *Example.*

```
45) 345678901 (     147411
         .....        2345
   2345              ------
   ----              737061
   11117            589644
    9380           442234
   -----          294822
    17478         --------
    16415         (345678901 Proof.
   ------         ---------
     9639
     9380                 7
    -----             5   X   0  } Proof.
      2590                7
      2345
     -----
       2451
       2345
      -----
      (106)
```

In proving (after I have set the Divisor under the Quo-
ient, as in the *Example*) I say 5 times 1 is 5, and 6 that
emains in the Units Place of the Remainder, is 11, 1 and
arry 1, &c. When I come to the third Figure in the
Aultiplier, I take in the 1 that stands in the Place of
Hundreds in the Remainder, as 3 times 1 is 3, and 1 is
, &c.

Division may be also proved by the Cross, as in *Multi-
lication*: For Trial, let us prove the foregoing Sum thus.

5 X First cast the Nines out of the Divisor, and there remains 5, which I place on the Left of the Cross (as you see in the Margin) then out of the Quotient, and there remains 0, which I set n the Right of the Cross; then I multiply these two to-
ether, and they make 0; but the Nines must have been
ast out there also, if by multiplying them together they
had

had made any, and what was over, carried to the *Remainder*, which here makes 7, which I set on the Top, as in the Margin. Laftly, I caft away the Nines out of the Dividend, and there refts 7 alfo, which I put underneath the Crofs, and finding the Top and Bottom Figures to be alike, I conclude the Work is right.

The foregoing Directions to the preceeding *Examples*, are fo plain and eafy, that there is no Occafion for any more; fo I fhall fet down fome more *Examples*, without any verbal Directions, thinking what hath been already faid to that Purpofe, to be fufficient.

More Examples.

Divifor 14)5873456(419532 *Quotient.*

```
   2
 5 X 6        56
   2          --
              27
              14
              --
              133
              126
              ---
               74
               70
               --
               45
               42
               --
               36
               28
               --
Remainder     (8)
```

```
47)27072329(576007
   235
   ---
   357
   329               5
   ---             2 X 2
   282               5
   282
   ---
    329
    329
    ---
    (0) Remainder.
```

```
Divisor 426)7890123(18521
                ....
          426          96)7400900(77092
   3      ---               ....
 3 X 8    3630           672                  2
   3      3408           ---                6 X 7
          ----           680                  2
           2221          672
           2130          ---
           ----           890
             912          864
             852          ---
             ---           260
              603          192
              426          ---
              ---          (68)
             (177)
```

Here follow some other Sums, with their *Quotients* and *Remainders* only; their Working being purposely omitted; leaving that to the Learner, for a Tryal of his Ingenuity.

As if you divide 796976499, by 49654, the *Quotient* will be 16050, and the *Remainder*, after the Work is ended, 29799.

Again, if you divide 5345678905, by 765432, the *Quotient* will be 6983, and the *Remainder* 667249.

Also, if you divide 45678901234 5, by 9876543, the *Quotient* will be 46249, and there will be a *Remainder* of 8775138.

And if you divide 123456789012, by 123456789, there will be for the *Quotient* 1000, and for the *Remainder* 12.

And that nothing may be wanting to a perfect Understanding of this *Rule*, I have subjoined the following *General Notes concerning* Division.

1st, So many Places as are in your *Divisor*, you point off so many in your *Dividend*, for you first *Dividual*, except the

the first Figure of the *Divisor* exceed the first of the *Dividend*, and then you move a Place farther towards the Right Hand, and make your Point there; and then your *Dividual* mark'd out, hath a Figure more than your *Divisor*; and then you must take the first Figure of your *Divisor* out of the two first Figures of your *Dividual*.

2dly, You never place a Cypher in the *Quotient* the first time you seek.

3dly, The times that you take the *Divisor* out of the *Dividend*, never exceed 9.

4thly, The *Dividual* never exceeds the *Divisor* above one Figure.

5thly, You never bring down but one Figure or Cypher at a time, out of the *Dividend*.

6thly, For every Figure or Cypher brought down from the *Dividend*, there must be one, or a Cypher placed in the *Quotient* also.

7thly, when you cannot take the Divisor out of the Dividual, you must put a Cypher in the Quotient, and take another Figure from the Dividend: And if, again, you cannot take it, place another Cyhper in the Quotient, and then seek again.

8thly, When, at any time, after you have subtracted, there remains nothing, and yet there remains a Cypher, or Cyphers in the Dividend, it, or them must be put in the Quotient as Part of it, and the Work is done; and there will be no Remainder.

The short Italian *Way of* DIVISION.

There is another Way of *Division* shorter than the foregoing, because you omit setting down the several Products of your *Multiplication*, but multiply and subtrrct together; and is like the common *Scratch* or *Cancelling* Way of *Division*, only you are not at the Trouble of removing your Divisor every time you seek, as in that Way you are.

Example.

Let us divide the second *Example* in Page 100, by this (as it is called) short *Italian* Way; *viz.* Divide 16790 Days by 365. In order to the Work, I set it down as before, thus;

365)16790(46
2190
(0)

Here I seek (as before) how oft I can have 3 in 16 (my Point being under 9, for the Dividual) and I find I can have but 4 times; wherefore I put 4 in the Quotient, and multiply the Divisor (as before) saying, 4 times 5 is 20, but I do not set down a 0, and carry 2, as in the other Way; for the Product must not be set down, as was said before, but forthwith subtract, saying, 4 times 5 is 20, 20 from 9 I cannot, but 20 from 29, (borrowing two Tens) and there remains 9, which I set under the Line; then 4 times 6 is 24, and 2 that I borrowed is 26, from 7 I cannot, but 26 from 27 and there remains 1, which I also set down; then 4 times 3 is 12, and 2 that I borrowed is 14, from 16 and there remains 2, which I place under the Line; then there is a Remainder of 219, to which I bring down the Cypher out of the Dividend, and then I have the last Dividual 2190; then I say the 3's in 21, 6 times, by which I multiply the Divisor, saying, 6 times 5 is 30, from 0 I cannot, but 30 from 30 (borrowing 3 Tens) and there rests 0; then 6 times 6 is 36, and 3 that I borrowed is 39, from 9 I cannot but 39 from 39 and there remains 0; then 6 times 3 is 18, and 3 that I borrow'd is 21, from 21, and there remains 0; and so the Work is done.

Let another *Example* be this: Divide 345678901 by 2345, which is the third *Example* in Page 101.

2345)345678901(1

11117

Here I ſay, once 5 is 5, from 6, and there remains 1, *&c.* then I bring down the 7, and ſet 4 in the *Quotient*, and ſay, 4 times 5 is 20, from 7 I cannot, but 20 from 27, and there remains 7. Then 4 times 4 is 16, and 2 that I borrowed is 18, from 1 I cannot, but 18 from 21, and there remains 3. Then 4 times 3 is 12, and 2 is 14, from 1 I cannot, but 14 from 21, and there remains 7. Then 4 times 2 is 8, and 2 is 10, from 11, and there remains 1; ſo that there remains 1737, to which I bring down the next Figure 8, for the Dividual, and the Work ſtands thus:

2345)345678901(14

11117

17378

Again: I ſeek, and put 7 in the *Quotient*, and ſay, 7 times 5 is 35, from 8 I cannot, but 35 from 38, and there remains 3. Then 7 times 4 is 28, and 3 that I borrowed is 31, from 7 I cannot, but 31 from 37, and there remains 6. Then 7 times 3 is 21, and 3 that I borrowed is 24, from 3 I cannot, but 24 from 33, and there remains 9. Then 7 times 2 is 14, and 3 that I borrowed is 17, from 17, and there remains 0. Then I bring down the next Figure 9, and the Work appears thus;

2345)

2345)3456789o(147

11117

17378

9639

Then I bring down the rest of the Figures, one after another, working as before, till the whole is finished in the following Manner.

2345)34567890I(147411

11117

17378

9639

2590

2451

Remainder (106)

Thus have I explained both the *Italian* Ways of Division, leaving it to the Learner to use which he likes best. But my Method will be to pursue the first *Italian* Way thro' the remaining Part of this Book, it being very plain and easy to be understood.

There is a very short Way of Division (I think the shortest that can be) by Cancelling; and so I shall give one *Example* to shew its Brevity: My Design, in this Book, being not only to shew the most intelligible, but the nearest Way to the Bush in all the Rules.

Example.

Example.

```
                     11(1
                     472(4
                    142584(3
Divide 6945407 by 276) 6945407 (21564
```

First I seek, and find I can take two times, and say, twice 6 is 12, from 4 I cannot, but 12 from 14 (the 4 being over the Point or Stop for the first Dividual) and there remains 2; then twice 7 is 14 and 1 is 15, from 19, 4; and twice 2 is 4 and 1 is 5, from 6, 1: And then there is 1425 for a new Dividual, &c. See the Work; the Quotient being 25164, and the Remainder 143.

VIII. When there is a Cypher, or Cyphers, in the Divisor, towards the right Hand, you may cut it, or them off, with a downright Stroke of the Pen, and also do the same with as many Figures, or Cyphers to the Right of the Dividend; and then divide the remaining Figures of the Dividend, by the remaining Figures of the Divisor, as if there had been no Cyphers in the Divisor, or Dividend; and what you cut off from the Dividend, is the Remainder, or Part of it: For what remains after the Work is done, must be put to what you cut off from the Dividend, for the whole Remainder.

Examples.

By the short Italian *Way.*

```
24|00)7964|06(320        345|000)8092320|000(23456
   72                        1192
   --                        ----
    49                        1573
    48                        ----
    --                         1932
Rem. (1406)                    ----
                                2070
                                ----
                           Rem. (0)
```

For

For the first of these *Examples*, there are two Cyphers in the *Divisor*, wherefore I cut off two Places from the *Dividend*, and divide 7694 by 24, and there remains 14 at the last; to which I bring down the two Places cut off, *viz.* 06, and annex them to the 14, for the whole *Remainder*, *viz.* 1406, and the *Quotient* is 320.

In the second *Example*, there are 3 Cyphers in the *Divisor*, which I cut off; and also as many in the *Dividend*; and divide by 345; and then the Work is done, and there remains nothing.

IX. Any Division Sum, when the Divisor is such a Number that any two Digits or Numbers in the Multiplication Table, being multiplied together, do make it, *viz.* the Divisor, then such Sum may be done at two Divisions, or by Component Parts, much sooner, and in fewer Figures than at one.

Examples.

Divide 16560 by 48.

At one Division.	*At two* Divisions, *or Component Parts.*
48)16560(345	6)16560
144	8) 2760
216	345 *Quotient.*
192	
240	
240	
(0)	

Here

Here the two Numbers in the Table, multiplied together, that make the Divisor, are 6 and 8, for 6 times 8 is 48, the Divisor; wherefore I divide the Dividend 16560 by 6, and the Quotient is 2760, which I divide by 8, the second Number, and the Quotient, by that, is the true Quotient sought, *viz.* 345, as in the common Way.

Bring 1212288 Ounces of *Raw Silk*, into Pounds of 24 Ounces.

At one Division.

```
24)1212288(50512
   120
   ---
    122
    120
    ---
      28
      24
      --
      48
      48
      --
      (0)
```

At two Divisions, or *Component Parts.*

```
12)1212288
   -------
 2)101024
   -------
    50512 Quot. sought.
```

Here are eleven Figures Difference between one Way and the other.

More Examples.

At one Division.

```
72)488808(6789
   432
   ---
    568
    504
    ---
     640
     576
     ---
      648
      648
      ---
      (0)
```

By two Divisions, *or Component (Parts.*

```
8)488808
  ------
9)61101
  ------
   6789 Quotient.
```

Here, if I had taken 6 and 12 for my Divisors, they would have produced the same Quotient, for 6 times 12 is 72, as well as 8 times 9.

```
(56 the Divisor.        (99 the Divisor.

 7)18648                 9)537768
   -----                   ------
 8) 2664                11) 59752
   -----                   ------
     333 Quotient sought    5432
```

If there happen to be any Remainder, either in the first or second Division, or in both, yet the Quotient will be the same. But when there are Remainders, the Way to find the true Remainder, as if you divided at once, is to multiply the first Divisor by the last *Remainder*, taking in the first Remainder, if any be.

Of

Of MONEY.

X. Now I will shew how to divide Pounds, Shillings, and Pence, without reducing them any otherwise than in your Mind; and also how this Rule answers many Questions that seem to require a Recourse to the *Rule of Three* for their Solution.

Divide *l.* 12 10 *s.* 6 *d.* among 5 Persons.

Divisor 5)12 10 6 *Dividend.*

Each must have 2 10 1 $\frac{1}{5}$ *Quotient* or *Answer.*

Here I say the Fives in 12, twice, and there remains 2, which are two Pounds, (for the Remainder is always the same with your Dividend) or 40 Shillings, and 10 *s.* in the Shillings Place, is 50 *s.* the Fives in 50, 10 times, which I put in its Place, *viz.* under the Place of Shillings. Then the Fives in 6, once, and there remains 1; which is one Fifth of a Penny. So each Man must have 2 *l.* 10 *s.* 1 *d.* $\frac{1}{5}$ for his Share.

The foregoing Work is much sooner done, and looks a great deal handsomer than that in the Margin; for there you are obliged to reduce the 12 *l.* 10 *s.* 6 *d.* into Pence, and then you divide by 5, and the Quotient gives the Pence each Person must have; and then them Pence are brought into Pounds, &c. The Sum above is proved by the brief Rules in Multiplication of Money, sufficiently shewn in that Rule, in the following Manner.

The common Way.

	l.	*s.*	*d.*
	12	10	6
	20		
	250		
	12		
5)	3006		
12)	601 ($\frac{1}{5}$		
2|0)	5|0 (1		
	l. 2	10	6 $\frac{1}{5}$

l. 2 &c.

l. 2	10	1 $\frac{2}{5}$	Each.
			5 Persons.
l. 12	10	6	Proof.

In this excellent Method of *Division* of several Denominations (for *Weight* or *Measure* may be so divided as well as *Money*) whatever remains, you always bring it (in your Mind only) into the Quality of the next Denomination towards the Right Hand ; and if there be any thing there, you take it in, and then seek, &c. as in the foregoing Sum, where I said, the Fives in 12, twice, and there remained 2, which I turned into Shillings, (the Name of the next Denomination) which with the 10 Shillings in the Place of Shillings, make 50 ; then I say, the Fives in Fifty, &c.

8)
Again, Divide *l.* 67 09 4 among 8 Persons.

Quotient *l.* 08 08 8 *Answer.*

Here I say, the Eights in 67, 8 times, and there remains 3 *l.* or 60 Shillings, and 9 Shillings in the Place of Shillings, is 69, the Eights in 69, 8 times, and there remains 5 Shillings, or 60 Pence, and the 4 *d.* in the Place of Pence, make 64 ; the Eights in 64, 8 times, and nothing remaining. So each must have *l.* 8. 08 8 as by the Work above.

If 5 Gallons of Brandy cost *l.* 1 16 *s.* 8 *d.* what is that the Gallon ?

A General Rule.

Divide the Money by the Quantity : And here I say, the Fives in 36, &c.

5)1 &c.

	l.	s.	d.
5)	1	16	8
Answer	0	07	4
			5
Proof.	1	16	8

If 9 Stone of Beef cost 16 s. 6 d. what is that a Stone?

	s.	d.
9)	16	6
	1	10 *Answ.*

If 9 Gallons of Arrack cost what is that a Gallon?

	l.	s.	d.
9)	4	08	11 $\frac{1}{2}$
Answer	0	09	09 $\frac{1}{2}$

If 11 C. of Hops cost what is that *per* C?

	l.	s.	d.
11)	53	01	06
Answer	4	16	06

If the Charge of a Country Feast amounts to 314 *l.* 16 *s.* 8 *d.* and it is to be paid by 12 Stewards, what must each Steward pay?

	l.	s.	d.	
12)	314	16	8	
Each must pay *l.*	26	04	8 $\frac{1}{2}$	$\frac{8}{12}$
				12
	314	16	8 *Proof.*	

XI. As in Division of one Denomination, according to the 9th Rule of this Chapter, where two Numbers in the *Multiplication Table* make the Divisor, being multiplied together, the Work might be perform'd at two Divisions; so in *Division* of several Denominations, the Work may be done after the same Method, following the Directions given in the said 9th Rule.

Example.

A Reckoning of *l.* 6 00 00 among 32 Men, what must each Man pay?

4)	*l.* 6	00	0
8)	1	10	0
Each pays	0	03	9

Here the two Numbers are 4 and 8, therefore I first divide by 4, and then that Quotient by 8; or first by 8, and then by 4, it will be all one.

If 56 lb. of Coffee cost what is that a Pound?

Here 7 times 8 makes 56 the Quantity.

7)	*l.* 21	11	8
8)	03	01	8
Answ.	00	07	8 $\frac{1}{8}$

Divide *l.* 32 12 6 between 100 Persons.

10)	32	12	6
10)	3	05	3
	0	06	6 $\frac{3}{10}$ each.

If

If 72 Gallons of Wine cost what a Gallon?

8)			
l.	19	4	1
9)	2	08	0
Answer	0	05	4

If 81 ℔ of Nutmegs cost what a Pound?

l.	49	17	3 ¾
9)	5	10	9 ¾
Ans.	0	12	3 ¾

If 45 C. of Hops cost what 1 C. Weight?

l. 5)	120	07	6
9)	24	01	6
Answ. l.	2	13	6

A general Rule for Weight.

Having the Price of C. Weight, to know the Price of a Pound. Divide by 7 and 8, (7 times 8 being 56, the Half Hundred Weight) and take the Half of the last Quotient, which Half will be the Answer.

Examples.

If 112 ℔. of Cast Iron cost what Pound?

7) *s.*	*d.*
2	4
8)	4
	2

The Half of a Half-penny is ¼ *Price of a* ℔.

If

If 112 lb of Lead, cost 7 *s.*
what a Pound?

8) 1

1 $\frac{1}{2}$

The Half is $\frac{3}{4}$

If 112 lb of Sugar cost
what a Pound?

7)
l. 1 17 4

8) 05 4

8

The Half of 8 is 4 *d. Answer.*

If 112 lb. of *Currants* cost
What a Pound?

7)
l. 3 · 10

8) 10

1 3

The Half of 15 *d.* is 7 $\frac{1}{2}$.

So at any time, in any *Division* Sum, if the Divisor be 112, the Quotient is soon found by this Way of *Division* by Parts.

I will leave one *Example* also by the common Way to shew the Tediousness of the one, and the Expedition of the other.

The

The common Way.

Divide *l.* 1476 19 8 $\frac{3}{4}$ between 27 Perſons.

```
        20
     -----
     29539
        12
    ------
    354476
         4
    -------
 27)1417907 Farthings.     4)52515 Farthings each.
    . . . .                -------
    135                    12)13128
    ---                    --------
     67                    2|0) 109|4
     54                    ---------------------
    ---                    Anſwer l. 54  14  0 3/4
    139                    ---------------------
    135
    ---
      40
      27
     ---
     137
     135
     ---
     (2)
```

The other Way.

```
l. 3)1476  19   8 3/4
   -------------------
  9) 492   06   6 3/4 2/3
   -------------------
Anſw. l. 54  14  0 3/4
   -------------------
```

Here is a prodigious Difference between one Way and the other, one having almoſt 60 Figures more in the Work than the other.

Note,

Note, That Weight and Measure may be divided by Parts, as Money.

Example.

If 42 Bags of *Spanish* Wool weigh what 1 Bag?

6)C.	qrs.	lb.
110	1	00
7) 18	1	14
Ans. 2	2	14

If 45 Pieces of Linnen contain what 1 Piece?

9)Yds.	qrs.	Nls.
2157	0	3
5) 239	2	3
Ans. 47	3	3

CHAP. VI.

REDUCTION.

I. IS wholly performed by *Multiplication* and *Division*; and teaches to bring or change Numbers of one Denomination, into Numbers of another, without the least Alteration of Value, tho' in different Terms. For Instance:

Suppose I am to bring 20*l.* into Farthings, which when I have done, the Work will produce 19200 Farthings, which

which are equal in Value to *l.* 20: For when they are reduced rightly back again, the last Quotient will precisely produce *l.* 20. neither more or less.

II. All great Names are brought into smaller, of equal Value, by *Multiplication*; that is, by multiplying the given Number by as many of the next lesser Name, as make one of that greater: As *Pounds* into *Shillings*, *Pence*, or *Farthings*: Or, *Tuns Weight* into *Pounds Weight*, &c.

III. All small Names are brought into greater, of equal Value, by *Division*: That is, by dividing the given Number by as many of the lesser, as make one of the next greater Name: As *Farthings* into *Pence*, *Shillings* or *Pounds*: Or *Pounds Weight* into *Quarters*, *Hundreds*, or *Tuns Weight*.

Example 1.

In 20 *l.* how many Farthings?	20 *s.*
20 Shillings make a Pound.	12
400 Shillings in 20 *l.*	Pence, 240 in a Pound.
12 Pence make 1 *s.*	4
4800 Pence in 20 *l.*	Farth. 960 in a Pound.
4 Farthings, one Penny.	
	Or thus:
19200 Farthings in 20 *l.*	20 *l.*
	960 Farthings in a Pound
	Farthings, 19200 Answer,

In the Question above, it is required to bring *Pounds* into *Farthings*, which is a great Name to be brought into a smaller; which according to the IId Rule of this Chapter, is to be done by *Multiplication*. Wherefore, as is there directed, I multiply the given Number 20 *l.* by 20,

the Shillings in a Pound, and the Product is the Shillings in 20 *l.* Then them Shillings by 12, the Pence in a Shilling, and the Product is the Pence in 20 *l.* and them Pence by 4, the Farthings in a Penny, and that Product is the Farthings in 20 *l.* and the Answer to the Question, as may be seen by the preceding Work.

Or, as before, I multiply the 20 *l.* by 960, the Farthings in a Pound, but I multiply 960 by 20, tho' the 20 be uppermost to save Room; for at any time the *Multiplier* may be multiplied by the *Multiplicand*; for the Product will be the same either Way.

By the foregoing Methods are all *Reductions* descending, (that is, from great Denominations to lesser) work'd, whether they be *Money*, *Weight* or *Measure*. That is, by considering how many of the next lesser, make a Unit, or one of the foregoing greater Denominations, as before directed; and then multiply accordingly, descending from one Denomination to the next, till the Work is finished. And for further Assistance, respect must be had to the several Tables of Quantity in *Money*, *Weight* and *Measure*, in the IId Chapter of this Book.

Pounds multiplied by 20 produce Shillings; Shillings multiplied by 12 give Pence, Pence multiplied by 4 produce Farthings.

Farthings divided by 4 are Pence, Pence divided by 12 are Shillings, Shillings divided by 20 are Pounds.

Example 2.

In 19200 Farthings, how many Pounds?

4)19200

12) 4800

2|0)40|0

l. 20 *Answer*

Or thus :

l.

96|0)1920|0(20
192

(0)

Here

Here it is required to bring Farthings into Pounds; which is a small Name into a greater; and therefore according to the IIId Rule of this Chapter, it is done by Division: Wherefore I divide the given Number, 19200 by 4, the Farthings in a Penny, and the Quotient is Pence, and them Pence I divide by 12, the Pence in a Shilling, and the Quotient is Shillings; and them Shillings I divide by 20, the Shillings in a Pound, and the Quotient is Pounds; to wit, 20 *l.* and is a sure Proof of the foregoing *Example*

Or I divide the 19200 Farthings by 960, the Farthings in a Pound, and the Quotient is the same, *viz.* 20 *l.*

Example 3.

In 576 *l.* how many Shillings, Pence, and Farthings?

```
By      20
   ---------
    11520 Shillings.
By     12
   ---------
   138240 Pence.
By      4
   ---------
   552960 Farthings.
```

(*This is a great Name to be brought into a smaller, and therefore I multiply.*)

Example 4.

In 552960 Farthings, how many Pence, Shillings, and Pounds?

```
            ⎧  4)552960
            ⎪  ---------
            ⎪ 12)138240
Divide by  <   ---------
            ⎪ 2|0)1152|0
            ⎪  ---------
            ⎩  l. 576 Answer and Proof.
```

This is the Reverse of the 3d *Example*, and a small Name to be brought into a great, and therefore I divide, and find *l.* 576 the Answer and Proof to the said *Example*; for *Reduction* ascending, proves *Reduction* descending; and so the contrary.

☞ Note, *When you are to bring Shillings into Pounds, (let the Number be what it will) cut off the last Figure, or Cypher, towards the Right Hand, and halve the other towards the Left, (which is dividing by 20, but shorter) and that Half shall be Pounds; and the Figure cut off is Shillings: And if any thing remain, after the halving of the last Figure, which is never more than one, it must be joined to the Figure, or Cypher cut off; as in the 4th* Example *foregoing, and in the subsequent following,* viz.

Bring 423|7 Shillings into Pounds.

l. 211 - 17

Here the ½ of 4 is 2, the ½ of 2 is 1, and the ½ of 3 is 1, and there remains 1, which is 1 Ten, which must be put to the 7 cut off, and it makes 17. So the whole is *l.* 211 - 17 as above. By the same Method may *Tuns* be reduced into *Hundreds Weight.*

A General Rule.

When you have Pounds to be reduced into Farthings, multiply by 20, by 12, and by 4; or by 960, the Fartheings in a Pound.

When you have Farthings to be reduced into Pounds, divide by 4, by 12, and by 20, or by 960.

If Pounds are to be brought into Pence, multiply by 240, the Pence in a Pound: If the contrary, divide by 240.

Example 5.

Reduce 476 *l.* into Pence.

```
        240
     ------
      19040   Here I multiply by
       952    12, and by 2, twice
     ------   12 being 24; and
Pence 114240  for the Cypher I add
     ------   it at the last.
```

Or thus: (*According to the 8th Rule of Chap.* 4.)

```
   476
    12
  ----
  5712
     2
  ------
  114240 Pence.
```

Reduce 114240 Pence into Pounds, by dividing by 240.

```
24|0)11424|0(476 Answer.
      96
     ---
      182
      168
      ---
       144
       144
       ---
       (0)
```

Or thus:

```
12)114240
  --------
 2)  9520
  --------
 l. 476 Answ.
```

Here, in the second Way, after I have cut off a Place from the *Dividend*, for the *Divisor's* Cypher, I divide by 12, and by 2, which multiplied together, make 24, and for the Cypher to make it 240, there's a Place cut off from the *Dividend*; so that I divide only by 12, and by 2, according to the IXth Rule of the foregoing Chapter. See the Work above.

By the second Way there are many Figures, and much Trouble saved; as may be seen by comparing one Way with the other.

Example 6.

Bring 476 Pounds into Farthings, by multiplying by 960

	960	Or thus :
	476	*l.* 476
	5760	8
	6720	3808
	3840	12
Farthings	456960	Farthings 456960

In the second Way I multiply by 8, and by 12, according to the VIIIth Rule of the IVth Chapter, 8 times 12 making 96, and I add the Cypher at last.

Example 7.

Bring 456960 Farthings into Pounds by dividing by 96|0)45696|0(446 *l.* Answer.

384	Or thus :
	8)45696|0
729	
672	12)5712
576	*l* 476 Answer.
576	
(0)	

IV. When the Sum to be reduced consists of several Denominations ; as Pounds, Shillings, and Pence, or Tuns, Hundreds, Quarters, and Pounds, then you must multiply as before ; but you must take in the Shillings, Pence, or Farthings, that stand in each Denomination, as you reduce the higher Name to the next inferior.

Example

Example 8.

In *l.* 426 19 8 $\frac{1}{2}$ how many Farthings?
20

8539 Shillings.
12

102476 Pence.
4

409906 Farthings. Anſwer.

Here I firſt multiply by 20, ſaying, 0 is nothing, but 9 that ſtands in the Units Place of Shillings, is 9; then twice 6 is 12, and 1 that ſtands in the Tens Place of Shillings is 13, 3 and carry one 1, &c. Then, when I come to reduce the Shillings into Pence, I ſay 12 times 9 is 108, and 8 that ſtands in the Place of Pence is 116, 6, and carry 11, &c. Then, when I reduce the Pence into Farthings, I ſay, 4 times 6 is 24, and 2 that ſtands in the Place of Farthings is 26, 6 and carry 2, &c. *See the Work.*

Example 9.

In 4)409906 Farthings, how many Pence, Shillings, (and Pounds?

d.
12)102476 $\frac{1}{2}$

s.
2|0) 8531|9-8 *d.*

l. 426 - 19 - 8 $\frac{1}{2}$ Anſwer and Proof.

I first divide by 4, and there remains $\frac{1}{2}$ that was taken in; then by 12, and there remains the 8 *d.* taken in; and then by 20, (or cut off the last Figure, and halve the other, as before directed, to bring Shillings into Pounds) and there remains the 19 Shillings taken in.

Example 10.

```
        4)
In      2403590 Farthings, how many Pounds, &c.
        -------
   12)  600897 1/2   Here I divide by 4, by 12, and by
        -------            20, according to the foregoing
   2|0) 50071|4-9 d.  general Rule.
```

Example 11.

```
In l. 2503 - 14 - 9 1/2 how many Farthings?
        20
   ---------
     50074          Here I multiply by 20, by 12, and by
        12            4, according to the beforementioned
   ---------          general Rule.
    600897
         4
   ---------
   2403590 Farthings.
   ---------
```

These two Sums are a Proof to each other.

Example

Example 12.

In *l.* 742 14 6 how many Pence?
      20

```
 14854
    12
178254 Answ.
```

Here I multiply by 20, and take in the 14 *s.* and then by 12, and take in the 6, according to the IVth Rule of this Chapter.

Example 13.

```
   12)
In 178254 Pence, how many Pounds, &c.

2|0) 1485|4-6

   l. 742-14-6 Answer.
```

In *l.* 759 17 8 ½ how many Halfpence?

Answer 364745

Multiply by 20, 12, and 2.

Bring 364745 Halfpence into Pounds, *&c.*

Divide by 2, 12, and 20.

Or Halfpence may be brought into Pounds by dividing componently, by 480, and Pounds ito Halfpence by multiplying by 480.

In *l.* 529 12 6 ⅝ how many Eights of a Penny?

Answer 1016885.

Multiply by 20, 12, and 8, taking in, *&c.*

Bring 1016885 Eights of a Penny into Pounds, &c.

Divide by 8, 12, and 20.

Any Number of Pence may be brought into Pounds, Shillings, and Pence, at one Working, thus: Add a Cypher to the given Number, and divide them by 240, as usual, doubling the last Figure of the Quotient for Shillings, and the Remainder is Pence: as for *Example*; Bring the foregoing 13th *Example, viz.* 178254 Pence into Pounds, Shillings, and Pence, at one Work.

```
24|0)178254|0(742 - 7
                    2
     168          ———
     ——— fac. 742-14-6
      102  ——————————
       96   Or thus:
      ———   2)178254
        65  ————————
        48  12)89127 - 6
      ———   ————————
       174       742 - 7
       168            2
      ———   ————————————
Rem.   (6)   l. 742-14 - 6
            ————————————
```

Here the last Figure 7, doubled, is 14 *s.* and the 6 *d.* remains.

Or thus:

```
12)178254
—————————
 2)14855|4-6
 ———————————
 l. 742 - 14-6
```

Here I omit the Cypher, because I neglect it in the Divisor.

So likewise may Farthings be brought into Pounds, Shillings, Pence, or Farthings at one Work, by adding a Cypher, and dividing by 960, doubling the last Figure of the Quotient for Shillings, as above.

Example.

Example.

In 39291 Farthings, how many *l. s. d.* and *qrs*?
Answer *l.* 40 18 6 $\frac{3}{4}$

```
96 | 0)39291 | 0(40  09
                     2
    384       ------------
    ---       l. 40  18  6 3/4 Answer
     891      ------------
     864
     ---
    (27) qrs. is 6 d. 3/4]
```

Or you may omit adding the Cypher to the given Number, since you cut off the Cypher from your Divisor; but you must not forget to double the last Figure. Or it may be done at two Divisons, thus:

```
        8)39291
        ---------
       12)4911 3/4
        ---------
          40-9 3/12
             2
        ---------
Facit. l. 40  18  6 3/4
        ---------
```

The first Remainder is $\frac{3}{4}$, and the last three Two-Pences.

Or by multiplying the first Divisor 8, by the last Remainder 3, taking in the first Remainder 3, (as the Rule in *Division* by Component Parts directs) makes 27 Farthings, equal to 6 *d.* $\frac{3}{4}$.

Of

Of COINS.

Here the several Species of *Coin* must be reduced into one Name, whether Shillings, Pence, or Farthings; and then divide the greater Number by the lesser, and the Quotient will be the Answer.

Example 1.

In *l.* 262 04 6 *Sterling*, how many Dollars, at 4 *s.* 3 *d. Sterling?*

```
In l. 262  04  6                    4 s. 3 d.
      20                            12
    ----                           ----
    5244                 Divisor 51 Pence.
      12
    ----            Doll.
51)62934 Pence. (1234 Answer.
```

As above directed, I reduce the Dollar into Pence, and they make 51; and then also the *l.* 262 04 6 into the same Name, *viz.* Pence; and they are 62934, which I divide by 51, the Pence in a Dollar; and the Quotient is the Answer, *viz.* 1234 Dollars.

Example 2.

In 1234 Dollars, at 4 *s.* 3 *d.* how many *l. Sterl.*

```
In   1234 Dollars, at 4 s. 3 d.
       51               12
     ----              ----
     1234 Multip.      51 Pence.
     6170              ----
     ----
  12)62934 Pence.
     -----
 2|0)5244|4  6
     --------
Answ. l. 262  04  6
```

Here I multiply the Number of Dollars by the Pence in one; and the Product is the Pence that are in them all; which I divide by 12, and by 20, which brings them Pence into Pounds.

Example

Example 3.

In *l.* 562 - 18 how many *French* Crowns at (54 *d.* $\frac{1}{8}$ *per* Crown.

```
   562 - 18            54 1/8
    20                  8
  ------              ----
  11258                433
     12
  ------
  135096
       8
  -------- Crowns.
433)1080768(2496 Answer.
    866
   ----
    2147
    1732
    ----
     4156
     3897
     ----
      2598
      2598
      ----
       (0)
```

Here I first bring the Crowns into Eights, by multiplying by 8, and taking in the 1 over the 8; and then I do the same, by *l.* 562 - 18, that the *Dividend* and *Divisor* may be of the like Name; and then I divide the one by the other, and the *Quotient* gives the Answer, *viz.* 2496 Crowns.

Example 4.

In 2496 *French* Crowns, at 54 *d.* $\frac{1}{8}$ *per* Crown, how
433 many *l. Sterl.* 8

7488 433
7488
9984

8)1080768 Eights.

12)135096
2|0)11258|8

l. 562 - 18 Anf. and Proof to the above Quest.

Example 5.

In 426 Pistoles at 17 *s.* each how many Guineas at
204 12 21 *s.* 6 *d.*
12

1704 Pence 204 Multiplier.
8520 Divisor 258 *d.*
Guin.
258)86904(336 $\frac{216}{258}$ Answ.
774

950
774

1764
1548

(216)

Here the Pence in 426 Pistoles, are divided by the Pence in a Guinea, and the Quotient is the Answer, *viz.* 346 Guineas, and 216 Pence over, which is 18 Shillings.

Example

Example 6.

In 336 Guineas, and 216 Pence, how many Pistoles at 17s. each?

Pence in a Guinea.

```
       336
       258
      ----
      2688
     1680
     672
       216 Pence that remained.
   -------
     86904
```

17
12

Divisor 204

Pistoles.

```
204)86904(426  Answer and Proof to the foregoing Question.
    816..
    ---
     530
     408
     ---
     1224
     1224
     ----
      (0)
```

Pistoles of 17s. are brought into Guineas of 21s. by multiplying by 17, and dividing by 21.

Example 7.

In 436 Pistoles, how many Guineas?

Answer 352 $\frac{20}{21}$. That is, 353 Guineas, wanting 1s.

Guineas into Pistoles, by the contrary Practice.

Example 8.

In 1546 Pieces of-Eight, at 4s. 6d. how many (l. *Sterling*?

```
     54 Pence in one        12
   ------ Piece of 8/8.    ----
   6184                     54
   7730
   ------
12)83484 Pence in them all.
 2|0)695|7
   --------
 l. 347-17 Answer.
   --------
```

Or this Question may be done by *Multiplication of Money*, according to the Method taught in that Rule, thus:

```
                                s.    d.
1546 Pieces of 8/8 at           4     6
                                      10
                           ------------
                     l. 02     05     0 The Val. of 10
                                      10
                           ------------
                        22     10    00 of 100
                                      10
                   --------------------
              1000—225         00    00
               500—112         10    00
                40—009         00    00
                 6—001         07    00
              ----  ----------------
Answ.         1546 l. 347      17    00
              ----  ----------------
```

Example

Example 9.

In *l.* 497 - 06 - 8 how many Marks at 13 *s.* 4 *d.*?

20 12

9946 Divisor 160

12

Marks.

16|0)11936|0(746 Answer

112

73

64

96

96

(0)

Or thus;

4)11936

4) 2984

Ans. 746 Marks.

Here 4 times 4 is 16, omitting the Cypher in the Divisor, and therefore cut none off from the Dividend.

Example 10.

In 746 Marks at 13 *s.* 4 *d.* how many *Pounds*?

160 12

44760 160

746

119360 Pence.

12)119360

2|0) 994|6-8 *d.*

l. 497 - 6 - 8 Ans.

Or Marks, or any thing else at 13 *s.* 4 *d.* are brought into *Pounds*, *&c.* by multiplying by 2, and dividing by 3, and what remains will be 1 or 2 Nobles.

Pounds Shillings and Pence are brought into Marks by adding $\frac{1}{2}$, as by *Example* the 9th.

In *l.* 497 06 8 how many Marks?

248 13 4

Marks 746 Answer.

Again

Again, Marks are brought into Pounds by deducting $\frac{1}{3}$, *Example* the 9th.

In 746 Marks, how many Pounds?
248 13 4 The $\frac{1}{3}$ to be deducted.

l. 497 06 8 Answ. and Proof to the Example above.

The 10th Example foregoing may be done by *Multiplication*, thus:

746 Marks at				13	4		
					10		
Or thus:							
746			*l.* 6	13	4	Value of	
4					10	10 Marks.	
2984			66	13	4	Ditto 100	
4					7	Marks.	
12)119360			466	13	4	Ditto	700
			26	13	4	Ditto	40
2[0)9941]6	8		4	00	0	Ditto	6
l. 497	06	8	Ans. *l.* 497	06	8		746

In the Example on the Left Hand, after I have multiplied by 4 and by 4, I annex a Cypher, to make the last Product Pence; in regard that there's a 0 in 160, the Pence in a Mark.

Example 11.

In *l.* 389 10 how many Florins at 3 *s.* 2 *d.*

```
In l. 389  10          3 s. 2 d.
       20                  12
   ------              ------
     7790                38 d.
       12              ------
   ------ Florins.
38)93480(2460 Answer.
   76...
   ---
    174
    152
    ---
     228
     228
     ---
     (0)
```

Example 12.

In 2460 Florins, at 3 *s.* 2 *d.* how many *l. Sterling* ?

```
In 2460 Florins,   at 3 s. 2 d.
     38               12
  -----             ----
  19680             38 Pence.
  7380
  -----
12)93480 Pence.
  -------
2|0)779|0
  -------
l. 389  10 Answer and Proof.
  -------
```

☞ *At any time when you can discover how many of one sort of Pieces, or Coin, are equal to any Number of the other, the Example is speedily done by multiplying by the lesser, and dividing by the greater Number.* Example, *In* 542 4 *d.* $\frac{1}{2}$ *how many* 13 *d.* $\frac{1}{2}$? *Multiply by* 3 *and divide by* 9. Ans. 180 $\frac{6}{8}$ pcs. 13 *d.* $\frac{1}{2}$.

Exam-

Example 13.

In 2712 Guilders, at 2 *s.* each, how many Rix-Dollars, at 4 *s.* 5 *d.* $\frac{1}{2}$?

```
In  2712  Guilders, at 2 s. each, how many Rix-Dol-
      96                            (lars, at 4 s. 5 d. 1/2 ?
   -----                                        12
   16272       Half-pence     48 in 2 s.   ---------
   24408                           2           53
 -------                       ----             4
214)260352(1216Rix.Dol. ]qrs. 96 in a Gil.  ------
    214                        ----   214 qrs. in a
    ---                                ----  (Dol.
     463
     428
     ---
      355
      214
     ----
     1412
     1284
     ----
     (128)
```

Here the Answer is, 1216 Rix-Dollars, and 128 Farthings, *Remainder*, or 2 *s.* 8 *d.*

Pounds are brought into Guineas by multiplying by 20, and dividing by 21; thus:

```
In 730 l. how many Guineas?
       20
  -------
  7)14600
  -------  s.
   3)2085  5
  -------         s.
Answer  695 Guineas, and 5 over.
```

In

In 695 Guineas, and 5 *s.* how many Pounds?

Guin. *s.*
695 5
7 and 3 multiply by.

4865 } The 5 Shillings
3 } taken in.

2|0)1460|0

l. 730 Proof.

Example 14.

In 789 *l.* how many Nobles, Marks, Crowns, Shillings, Pence, and Farthings?

Nobles in 20 *s.*	3
Nobles	2394
Marks	1197
	798
Crowns in a Pound	4
Crowns	3192
Shillings in a Crown	5
Shillings	15960
Pence in a Shilling	12
Pence.	191520
Farthings in a Penny	4
Farthings	766080

I bring the Nobles into Marks, by dividing them by 2, because 2 Nobles make a Mark.

Examples at large.

In *l.* 74622 17 6 how many Half-Crowns?

Multiply by 8, and take in 7. Answ. 596983.

In *l.* 22740 13 4 how many Nobles?

Multiply by 3, and take in 2. Answ. 68222.

In 76543 *Bitts* of *Jamaica*, each 7 *d.* $\frac{1}{2}$ *Sterling*, how many Pounds *Sterling*?

Answ. *l.* 2391 19 4 $\frac{1}{2}$.

In *l.* 1725 19 4 *Sterling*, how many *Spanish* Dollors, at 4 *s.* 4 *d.*

Answ. 7966.

In 279623 Millreas of *Portugal*, at 5 *s*, 3 *d.* $\frac{1}{4}$ how many Pounds *Sterling*?

Answ. *l.* 73692 06 2 $\frac{3}{4}$.

In 1276 Moidores, at 26 *s.* 6 *d.* how many Guineas, at 21 *s.*

Answ. 1610 $\frac{48}{252}$.

In 150000 Crusadoes, each 400 Reis, 1000 Reis to a Millrea, at 5 *s.* 6 *d.* *Sterling*, how many Pounds *Sterling*?

Answ. 16500.

In *l.* 3400 how many Crowns, Half-Crowns, Shillings, Groats, and Three-Pences, and of each the same Number?

Answ. 7486 Pieces of each sort, and 26 *d.* over.

Avoirdupois.

Avoirdupois-Weight.

In reducing this Weight, *Troy-Weight*, or of *Measure*, *Time*, &c. you must be acquainted with the *Tables of Quantity*, in the 2d Chapter of this Book.

Example 1.

Tuns. C. *qrs.* lb.
In 24 14 3 15 how many Pounds Weight?
20 C. 1 Tun.

494 Hundreds Weight.
4 Qrs. 1 C.

1979 Quarters.
28 lb. 1 qr.

15837
3959

Ans. 55427 Pounds.

Here are great Names to be brought into smaller, and therefore to be done by *Multiplication*; wherefore I multiply, according to the Table in the aforementioned Chapter, *viz.* by 20, by 4, and by 28; taking in the odd Weight in each Denomination, as in *Reduction of Money*; and the last Product is the Answer, *viz.* 55427.

Example 2.

Example 2.

```
   28)
In 55427 Pounds, how many Tuns, &c.
   ...
  28                    4)1979
 ----                  --------
  274                  2|0) 494|4 - 3
  252                  ---------------
 ----                  Tuns 24  14  3  15 Ans.
   222                 ---------------
   196
   ---
    267
    252
    ---
    (15)
```

Here I proceed reversely, dividing by 28, by 4, and by 20. Or this *Division* Sum may be done by 4 and 7, the component Parts of 28.

Example 3.

	C.	*qrs.*	*lb.*	*oz.*	*dr.*	
In	24	3	24	12	14	how many Drams?

```
  4 Qrs. 1 C
 ----
  99 Quarters.
  28 lb. 1 Quarter.
 ----
 796
 200
 ----
 2796 Pounds.
   16 Oz. 1 lb.
 ----
 16778
 2797
 -----
 44748 Ounces.
    16 Drams 1 Oz.
 ------
 268492
 44749
 ------
```

In 16)715982 Drams, how many Hundreds, &c.

```
16)715982               4)
   64....     16)44748   [28)2796(99
   --            32...       252 .—qrs.
   75            ---         ---  24 3
   64            127         276
   --            112         252
   119           ---         ---
   112            154        (24)
   ---            144
    78            ---
    64            108
    --             96
   142            ---
   128  4)99 Qrs. (12)
   ---
  (14) C. 24  3  24  12  14 Ans. and Proof.
```


Example

Example 4.

In *C.* 24 3 26 how many Pounds?

```
      4
   ------
     99
     28
   ------
    798
    200
   ------
Ans. 2798 Pounds
```

Or thus:

```
 112 lb, a C Weight.
  24 The Number of C.
 ----
 448
 224
 110 The odd Weight.
 ----
l. 2798 Ans.
```

Example 5.

```
         C.  qrs. lb.
      In 425  3   22 how many Pounds?
Mult. by 112
        ------
        5100
        425
         106 Odd Wt.
        ------
       47706 Answer.
```

Here I say, 12 times 5 is 60, &c. and take in the odd Weight.

A Quicker Way.

Hundreds, Quarters, and Pounds, may be speedily reduced into Pounds, thus: Set down the Gross Hundreds, four several Times, in the Form following, and take in the odd Weight, as above.

```
      C.  qrs. lb.
   In 24   3   26
      24
     24
    24
      110 Odd Weight.
    ------
Ans. 2798 Pounds as above.
    ------
```

Here

Here is nothing to do but to set the Hundreds down, as before, with the odd Weight, and add them together, and therefore it is the shortest Way of all other to reduce Hundreds gross into Pounds.

More Examples.

In C. 27 3 19 how many Pounds?

```
 27                      112 lb. 1 C. Weight.
 27                       27
 27                      ----
103 Odd Weight.          784
----                     224
Answer 3127 Pounds.      103 Odd Weight.
       ----              ----
                        3127 Proof.
                        ----
```

In 1 Hogshead, qt. C. 7 ½ 12 how many Pounds?

```
   7
   7
7,68 Odd Weight.
----
Answ. 852 Pounds.
      ----
```

In 256 1 17 how many Pounds?

```
   256
   256
256,45 Odd Wt.
------
Ans. 28717 Pounds.
```

In C. 4 3 27 how many Pounds?

```
    4                    112 lb. 1 C. Wt.
   4                       4
  4                      ———
  111 Odd Wt.            448
  ———                    111 Odd Weight.
  559 Answer.            ———
  ———                    559 Proof.
                         ———
```

Examples at large.

In C. 9 ½ 14 lb. of Indigo, how many Pounds?

```
   112
  ————
  1078 Answer.
  ————
```

In C. 246 ¾ of Cotton Yarn, how many Pounds?

Answer 27636.

	Tuns.	*C.*	*qrs.*	lb.	
In	276	12	3	24	of Cheese, how many Pounds?

Answer 619692.

In 574859 Pounds of Copper, how many Tuns, &c.

	Tuns.	*C.*	*qrs.*	lb
Divide by 112, &c. Answ.	256	12	2	19.

In 426 C. of Tobacco, how many Boxes, each to weigh 12 lb.

Answer 3976.

In C. 417 3 12 of Pimento, how many Casks, Each C. 3 ¾ 26 lb.

Answer 120.

Suppose

Suppose 6 Oxen weigh *C.* 38 2 8 how many Stone?
Answer 540.

Silk of 24 Ounces to the Pound, is reduced to Pounds of 16 Ounces by adding $\frac{1}{2}$, because 8, the $\frac{1}{2}$ of 16, is the Difference between 16 and 24.

Example.

Reduce 756 lb. of *Tripoli* Belladine Silk, of 24 Ounces to the Pound, to 16 Ounces to the Pound?

```
  756                 Short Way.
   24                 756
 -----                378 The ½ added.
 3024                ----
1512                 1134 Answer.
 -----               ----
16)18144(1134 Answer.
 -----
```

If I have *C.* 155 3 22 of Beef for Sea Use, and to be cut into Pieces, *viz.* into $\frac{1}{2}$ Pound Pieces, Pound Pieces, Pound and $\frac{1}{2}$ Pieces, 2 Pound Pieces, 3 and 4 Pound Pieces: and of each of these Quantities an equal Number, *i. e.* as many Pieces of 4 Pounds each, as of Pieces of $\frac{1}{2}$ Pounds, &c. each, what is the Number?

Ans. 1455 Pieces and $\frac{6}{12}$, or $\frac{1}{2}$ Piece of each Quant.

TROY WEIGHT.

```
    lb.  oz. dwt. gr.
In  212  10  17   22 how many Grains?
     12 Ounces 1 Pound.
   -----
   2554 Ounces.
     20 dwt. 1 Ounce.
   -----
  51097 Penny Weights.
     24 Grains 1 dwt.
   -----
 204390
102196
 -----
1226350 Grains, Answer.
```

In 1226350 *Grains*, how many *Pounds*, &c.?

```
                    2|0)
24) 1226350 (     5109|7
    120....      ---------
    ---        12)2554   17
      26       ---------------------
      24       lb. 212   10   17   22
      ---      ---------------------
       235
       216
       ---
        190
        168
        ---
        (22)
```

In 246 Ingots of Silver, each weighing 4 lb. $\frac{1}{2}$ *Troy*, how many Ounces?

Answer 13284 *Oz.*

Out of 79640 *oz.* of Silver, how many Snuff-Boxes may be made, each to weigh 3 *oz.* $\frac{3}{4}$?

Answer 21237 Boxes, $\frac{9}{15}$ or $\frac{3}{5}$.

What Quantity of Gold must there be to make 674 Funeral Rings, each to weigh 3 *dwt.* 12 *Grains.*

Answer 117 *oz.* 19 *dwt.*

In 47624 Bars of *Spanish Silver*, each 36 *oz.* $\frac{1}{4}$ how many Ounces?

Answer 1726370 *oz.*

CLOTH

CLOTH MEASURE.

Yds. qrs. Nls.
In 246 3 2 how many Nails ?
4 *qrs.* 1 *Yard.*

987
4 Nails 1 Quarter.
Answer 3950 Nails

In 426 Ells *Flemish*, how many Ells *Engl.*
3 *qrs.* 1 Ell *Flem.*

5 *qrs.* 1 Ell *English.* } 5) 1278 *qrs.*

Engl. Ells 255 $\frac{3}{5}$ *Answ.*

Or you may multiply by 6 Half Quarters, and divide by 10 Half Quarters, which is shortest ; because in dividing by 10, you only cut off a Figure from the Dividend, and the Work is done.

In 5426 Ells *Flemish*, how many Yards.
3

4) 16278

Answ. 1069 $\frac{2}{4}$ or $\frac{1}{2}$ a Yard.]

In 376 *French* Aulmns, how many Yards ?
6 *qrs.* 1 *Fr.* Aulmn.

4) 2256

564 *Yards, Answer.*

In 564 Yards, how many Aulmns?

```
   564
     4
6)2256
   376 Answer and Proof.
```

Ells *English* are reduced into Yards by adding $\frac{1}{4}$.

More Examples.

In 426 Ells *English*, how many Yards?

```
106 - 2  the 1/4 to be added.
532 - 2  Facit.
```

On the contrary, Yards are brought into Ells *English* by subtracting $\frac{1}{5}$.

In 532 Yards $\frac{1}{2}$ how many Ells *English*?

```
       106 the 1/5 to be subtracted.
Answer 426 Ells English.
```

Ells *Flemish* are brought into Yards by deducting $\frac{1}{4}$

In 5960 Ells *Flemish*, how many Yards?

```
       1490 the 1/4 to be subtracted.
Answer 4470 Yards.
```

Yards are reduced to Ells *Flemish* by adding $\frac{1}{3}$

In 4470 Yards, how many Ells *Flemish*?

```
       1490 the 1/3 to be added.
Answer 5960
```

Ells

Ells *Flemish* are brought into Ells *English* as expressed before, *viz.* by multiplying by 6, and dividing by 10; or cutting off the last Figure or Cypher.

In 4920 Ells *Flemish*, how many Ells *English*?
6

10)2952,0

Ans. 2952 Ells *English*.

Ells *English* are reduced into Ells *Flemish*, by adding a Cypher, and dividing by 6, or by adding $\frac{2}{3}$.

In 4726 Ells *English*, how many Ells *Flemish*?

6)4726,0

Ans. 7876 $\frac{4}{6}$ or $\frac{2}{3}$ Ells. *Fl.*

Or thus:

4726
1575 $\frac{1}{3}$
1575 $\frac{1}{3}$ } The $\frac{2}{3}$ to be added.

As before 7876 $\frac{2}{3}$.

LIQUID MEASURE.

Tuns Hds. Gall.
In 65 2 24 how many Pints of Wine?
4 *Hhds.* 1 *Tun.*

262 *Hogsheads.*
63 *Gall.* 1 *Hhd.*

790
1574

16530 *Gallons.*
8 *Pints* 1 *Gall.*

132240 *Pints*, Answ.

8)
In 132240 Pints of Wine, how many Tuns, &c.
——— 4)
63)16530(262 *Hogsheads.*
126 . . —— *hhds. gall.*
——*Tuns* 65 2 24 Answer.
393 ———
378
——
150
126
——
(24)

In 20 Tuns of Beer, how many Quarts?
4 Hogsheads, 1 Tun.
——
80
54 Gall. 1 Hogshead of Beer.
——
320
400
——
4320 Gallons.
4 Quarts 1 Gall.
——
17280 Quarts, *Answer.*

54 Gallons make a Hogshead of Beer, therefore to bring Firkins into Hogsheads take $\frac{1}{6}$ Part, or divide by 6, and it quotes Hogsheads, because 6 times 9, the Gallons in a Firkin, makes 54.

To bring Hogsheads into Barrels, add $\frac{1}{2}$, because 18, the $\frac{1}{2}$ of a Barrel, and 36 the whole, make 54, the Hogshead. To bring Kilderkins into Hogsheads, divide by 3, because 3 times 18 makes 54. Barrels are brought into Tuns, by dividing by 7, as follows.

7)
In 420 Barrels, how many Tuns?
——
60 Answer.

Ex-

Examples.

Admit a Ships Cargo from the *Canaries*, to be, *viz.* 250 Pipes, 130 Hogsheads, and 150 Quarter Casks; how many Gallons in all: And allowing every Pint to be a Pound, what the Weight also.

Answer 44415 Gallons, and 158 Tuns 12 C. $\frac{1}{2}$.

In 444 Firkins of Ale, how many Pints?

Answ. 28416.

In 74640 Pints of Beer, how many Barrels?

Answer 259 $\frac{6}{36}$.

In 45 Fats, or Vates of Rhenish Wine, each of 242 Gallons, how many *Aumn* Casks, each 42 Gallons?

Ans. 259 $\frac{12}{42}$

Note, *Rhenish Wine is sold by the* Aumn, *of about* 42 *Gal.*

In 57 Pipes and 42 Gallons of *Madera* Wine, how many Puncheons, Hogsheads, and Tierces?

Answer 86 Pun. 114 Hhds. 42 Gall. 172 Tier.

In 40 *Tuns, and* 50 *Buts, and* 60 *Pipes of Wine,*
How many Tierces do they make, admit they came from Rhine.

Ans. 570.

DRY MEASURE.

	Lasts	*Qrs.*	*Bush.*	*Gall.*	
In	24	7	6	2	how many Gallons of Wheat?

10 Quarters 1 Last.

247 Quarters.
8 Bush. 1 Quarter.

1982 Bushels.
8 Gallons 1 Bush.

15858

In

In 40 Lasts of Barley, how many Combs?

Answer 800.

In 3228 Fats, or Vates of Sea-Coal, how many Chaldrons and Scores?

Answer { 807 Chaldrons. 38 $\frac{9}{21}$ Scores.

In 33 Weys of Salt, how many Quarters, Bushels, and Pecks?

Answer { 165 Quarters. 1320 Bushels. 5280 Pecks.

In 20 Lasts and 30 Weys of Corn, that's called Rye,
How many Bushels do they make, if you by Bushel buy?

Answ. 2800 Bushels.

In 38880 Pecks of Sea-Coal, how many Chaldrons?

Answer 270.

LONG MEASURE.

In 50 Miles how many Barley Corns in Length?

```
     8 Furlongs 1 Mile.
   ----
   400 Furlongs.
   220 Yards 1 Furlong.
   ----
  8000
  800
  -----
 88000 Yards.
     3 Foot 1 Yard.
 -----
264000 Feet.
    12 Inches 1 Foot.
 -------
3168000 Inches.
      3 Barl. Corns 1 Inch.
 -------
9504000 Barley Corns in 50 Miles.
```

In

In 17490 Square Poles, how many Acres, &c.

```
16|0)1749|0(109 Acres.
    16..
    ----
     149
     144
    ----
  5|0) 5|0( 1 Rood.
       4
     ----                Acr.  Rood.  Poles.
     (10)      Answer 109     1      10
```

Here is a small Name to be brought into a great, and therefore it is perform'd by Division; wherefore I divide the Square Poles by 160, the square Poles in an Acre, and the Quotient is Acres, and the Remainder is Poles, which I divide by 40, the square Poles in a Rood, and there comes but 1 Rood, or $\frac{1}{4}$ of an Acre, and 10 Poles remain. So the whole is 109 Acres, 1 Rood, and 10 Poles, as by the Work above.

TIME.

I desire to know how many Days, Hours and Minutes, there are since the Birth of our Saviour to this present Year.

```
                              1734
                               365 Days in a Year.
                             ------
 1734                         8670
    6 Hours want-            10404
 ------ ing.                 5202
 10404 Hours                 ------
 ------ added               632910 Days.
                                24 Hours in a Day.
                            ------
                           2531640
                          1265820
                          --------
                          15189840
                             10404  Hours added.
                          --------
                          15200244 Hours.
                                60 Minutes in an Hour.
                         ---------
                         912014640 Minutes.
```

Here

Here, in regard that there are 6 Hours lost ever Year, (for the Year consists of 365 Days, 6 Hours) I multiply the Year by 6, which produces 10380 Hours to be added to the Product of Hours.

Or it may be done thus: Bring a Year into Hours, in which you will find 8766, by which multiply the Number of Years; and that *Product* by 60, and the last *Product* will be the Answer; as by the following Work.

Days. *Hours.*	
365 6 a Year.	1734 Years.
24 Hours 1 Day.	8766 Hours in a Year.
1466	10404
730	10404
	12138
8766	13872
	15200244 Hours since.
	60
	912014640 Minutes since.

From the *6th* of *June*, 1682 to the 15*th* of *August*, exclusive, 1721; how many Days; adding 9 Days for the Leap-Years, being 1 Day every 4*th* Year?

Answer. 14313.

From the 19*th* of *August*, 1701, to the 21*st* of *January*, exclusive, 1717, (noting the Leap-Years) how many Days? *Answer* 5998,

Here follow some Questions, promiscuously set for the Exercise of the Learner's Ability.

In 305 *l.* 12 *s.* 7 *d.* how many Half Pence? *Answer* 146702.

In 3192 lb. Weight, how many Hundred Weight? *Answer* 28 C. $\frac{1}{2}$.

In 3 C. $\frac{3}{4}$ of *Tobacco*, how many 12 lb. Boxes? *Answer* 35.

In

In 270 lb. 11 oz. 12 *dwt.* how many Penny-Weights? *Answer* 65032.

In 730 Rix-Dollars, at 4 *s.* 5 *d.* $\frac{3}{4}$, how many Ducats, at 4 *s.* 4 *d.* ? *Answer* 754 $\frac{118}{208}$, or 2 *s.* 5 *d.* $\frac{1}{2}$. over.

In 3 lb. 10 *oz.* of Gold, how many Mourning Rings, each 2 *dwt,* 12 *Grains.* *Answer* 368.

In 1260 Quarts, how many Hogsheads of Wine? *Answer* 5 Hogsheads.

In 60 Kintals of *Pruans,* how many C. Weight, (a Kintal being 100 lb.) *Answer* 53 C. 2 *qrs.* 8 lb.

In 506 *l.* 12 *s.* 2 *d.* how many *Portugal* Reas at 20 for 3 *d.*? *Answer* 810560 $\frac{2}{3}$.

In 56 Boxes of Sugar, each 2 *C.* $\frac{3}{4}$, how many *C.* Weight? *Answer* 154.

In 4679 Yards, how many Ells *English*? *Answer* 3743 $\frac{1}{5}$.

In 86 *l.* how many Guineas, at 21 *s.* 6 *d.*? *Answer* 80 Guineas.

In 88000 Yards, how many Miles? *Answer* 50.

In 14703 Ells *Flemish*, how many Yards? *Answer* 11070 Yards.

In 75 *C.* 3 *qrs.* 20 lb. how many Pounds? *Answer* 8504 lb.

In 176 *C.* 2 *qrs.* 24 lb. of *Sugar* at *Jamaica,* (the *C.* Weight being 100 lb.) how many *C.* Weight at *London*, the *C.* Weight being 112? *Answ.* 157 *C.* 3 *qrs.* 6 lb.

In 6000 *French Crowns* at 57 *d.* each, how many Pounds Sterling? *Answer* 1425.

In 34 lb. 6 *oz.* *Troy*, how many Ounces? *Answer* 414 Ounces.

In Guineas 90, *and in Pistoles nine,*
How many Pence, and what in Sterling Coin?

The Guineas at 21 *s.* and Pistoles at 17 *s.*	}	*Answer* 24516 Pence, or 102 *l.* 3 *s.*

In 46 Packs of Cloth, each Pack 24 Pieces, and each Piece 42 Ells *Flemish*, how many Ells *English* and Yards? *Answ.* 27820 $\frac{4}{5}$ *Engl.* Ells, and 34776 Yards.

If

If I had Nobles Eighty Score, and Marks just Fifty two,
In part of Fourteen Hundred Pounds, what Money rests still due? Answer 832 *l.*

How many times doth a regular Clock strike in a Year? Answer 56940

In 15420 *Vares* of *Valencia*, 100 of which make 85 Yards *English*, how many Yards and Ells *English*?

Answer 13090 $\frac{20}{85}$ or $\frac{4}{17}$ Yds. and 10472 Ells *English*.

CHAP. VII.

Of TARE and TRET, &c.

GRoss Weight is the Weight of a Commodity, with the Weight of the Hogshead, Chest, Cask, Box, Wrapper, or any Thing else that contains the Goods: Or any Quantity given in *Hundreds*, *Quarters*, and *Pounds*, is *Gross Weight*.

TARE is an Allowance made by the Seller to the Buyer, for the Weight of the Hogshead, Cask, Chest, Box, Bag, *&c.* wherein the Goods are contained. And is sometimes reckoned at so much *per* Bale, Bag, Barrel, Chest, *&c.* As in *Silks*, *Cottons*, *Raisins*, *Capers*: at other times at so much *per C.* as 10, 14, 16, or 24 lb. *per C.* There is also a Distinction of *Custom-house* and *Invoice* Tare, as in *Tobacco's*, and *Indigo's*, *&c.* and sometimes uncertain, as in *Tobacco's* and *Sugars*, happening according to the Size of the Casks.

TRET is an allowance of 4 lb. upon every 104 lb. *Suttle*, claimed by Free-Men of *London*, (and sometimes to others also) and this is allowed for Waste and Dust on some sorts of Goods: as on *Tobacco's*, *Spices*, *Drugs*, *&c.*

CLOFF

CLOFF is an Allowance of 2 ℔. upon every Draught above 3 C. Weight, to Citizens of *London*.

Neat Weight is what remains when the Allowances are deducted.

Example.

In 29 Bags of *Hops*, containing *Gross* 88 C. 1 *qr*. 19 ℔ *Tare* 4 ℔ *per* C. how many C. neat?

	C.	qrs.	lb.
Gross	88	1	19
Tare	3	0	17
Neat	85	1	02

C.	qrs.	lb.
88	1	19
4 ℔ *per* C.		

112) 353 *Tare* (3 C.
336

(17)

I multiply the given Hundred by 4, the *Tare* allowed for each Hundred, which produces, with 1 ℔ allowed for the Quarter, 353 ℔ *Tare*, which I divide by 112, and the Quotient gives 3 *C*. Weight, and 17 ℔. remains, which I subtract from the *Gross* Weight, and the Remainder is *C*. 85 1 02 for the neat Weight. See the Work.

When the *Tare* is at so much *per* C. Wt. multiply the *Gross Weight* by the *Tare*, and divide the Product by 112, and the Quotient will be the *Tare*. Or subtract the *Tare per* C. from 112, and by the Remainder multiply the *Gross Weight*, and the Product divide by 112, and the Quotient will be the neat Weight. Or if you multiply the Pounds *Gross* by the Pounds *Tare*, and divide by 112, the Quotient gives the Pounds *Tare*.

In 7 Bags of *Cotton*, each 2 C. ½, *Tare* 7 ℔. *per* Bag, how many Pounds neat?

2 ½ C. each — 7 Bags.
7 — 7 lb. *Tare* each.

17 ½ — 49 lb. *Tare.*
17
17
17,56 the ½ C.

From 1960 lb. Groſs.
Sub. 49 lb. Tare.

Anſ. 1911 lb. Neat.

In 27 Bags of Pepper, containing,

		C.	qrs.	lb.	
4 lb. Bag.	Groſs	58	3	11	Tare 4 lb. *per* Bag.
—— Tare.		58			
108 lb. Tare		58			
		58,95	for 3 qrs. 11 lb.		

[How many Pounds Neat?] 6591 pounds groſs.
108 Tare.

Anſw. 6483 pounds Neat.

Three Hogſheads of *Tobacco*, Wt. *viz.*

No.				
1	C. 5	1	17	Tare 90 lb.
2	C. 6	2	10	—— 87
3	C. 5	3	20	—— 85
	17	3	19	—— 262

17
17
17
17
103 Odd Weight.

[How many pounds neat?

2007 Groſs pounds.
262 pounds Tare.

Anſw. 1745 pounds Neat.

Four

Four Barrels of *Indigo*, qt. *viz.*

		C.	qrs.	lb.		lb.
Nº.	1	4	1	10	Tare	36
	2 qt.	3	3	20	——	29
	3	4	0	19	——	32
	4	4	0	00	——	35
How many Pounds neat ?		16	1	21	——	132

Answer lb. 1709

Six Hogsheads of *Tobacco*, Wt. *viz.*

Tret 4 lb. *per* 104 lb. and *Cloff* 12 lb. How many Pounds neat ?

	C.	qrs.	lb.		lb.
	4	3	21	Tare	76
	5	2	17	——	96
	6	1	20	——	100
	4	3	24	——	84
	7	1	13	——	102
	5	2	26	——	98
Gross	35	9	09	——	556

35
35
35 9

3929 Pounds Gross.
556 Pounds Tare.

3373 Pounds Suttle.
129 ½ Pounds Tret.

3243 ½ Rest.
12 Cloff.

Answ. 3231 ½ lb. Neat Weight.

The *Tret* is always found out, by dividing the Suttle Pounds by 26 ; because 4 times 26 is 104.

```
       lb.
26)3373(129 ½
   26..
   ----
    77
    52
   ----
    253
    234
   ----
   (19)
```

The half Pound in the *Tret* is allowed for the 19 Pounds remaining.

In

In 5 Barrels of *Nutmegs*, Wt. 18 C. $\frac{1}{2}$, 07 lb. *Gross*, *Tare* 30 Pound *per* Barrel; and *Tret* 4 Pound *per* 104 lb. how many Pounds neat?

	C.	*qrs.*	lb.
30 lb. Tare.	18	2	07 Grofs.
5 Bar.	18		
——	18		
150 Tare	18,63		

2079 Pounds Grofs.
150 Tare. 26)1929(74 lb. *Tret.*
        182
1929 Reft.
74 Tret.   109
        104
1855 Anf.
        (5)

When the *Tare* is at fo many Pounds *per Cent* or 112 lb. if it happen to be any even part of a Hundred Weight, it may be fooner done by dividing the *Grofs* Wt. by that part, according to the Rule of *Divifion* of feveral Denominations: As admit it be at 14 lb. *Tare per Cent.* then take the 8th part of the *Grofs Weight*, or divide it by 8, becaufe 14 lb. is the 8th part of a Hundred Weight, and the Quotient will be the *Tare* in *Grofs Weight*, which fubtract from the firft *Grofs Weight*, and the Remainder will be the *Neat Weight.*

Example.

	C.	*qrs.*	*lb.*	
20 Bags, *qt.* (8)	48	1	24	*Grofs, Tare,* 14 *lb. per C.*
14 Pound *per C.*				
	6	0	06 $\frac{1}{2}$	*Tare.*
Facit C.	42	0	17 $\frac{1}{2}$	*Neat Wt.*

Here I fay, the Eights in 48, 6 times; then the Eights in 1, 0 times, but turning it into Pounds, that is 28, and

24 in

24 in the Place of Pounds make 52; then the Eights in 52, 6 times; and there rests 4, which I multiply by 4, the Quarters in a Pound, and they make 16; then the Eights in 16, twice, or ½ a Pound. So the *Tare* is 6 *C.* 0 *qrs.* 06 lb. ½, which I subtract from 48 *C.* 1 *qr.* 24 lb. and the Remainder is 42 *C.* 0 *qrs.* 17 lb. ½, for the Neat Weight; as by the Work above.

If the *Tare* be 16 lb. *per Cent.* then divide the *Gross Weight* by 7, because 16 lb. is the 7th Part of a Hundred Weight.

Example.

12 Hhds	*C.*	*qrs.*	lb.	
qt. (7	59	3	14	at 16 lb. *per Cent.*
Tare	8	2	06	the 5th Part.
Neat Wt.	51	1	08	

If the *Tare* be 18 lb. *per Cent.* then for 16 Pounds work as in the last *Example*; and for the 2 Pound take the 8th part of the Quotient, and add them together for the whole *Tare.*

If the *Tare* be 20 lb, *per Cent.* then for the 16 Pounds work as before; and for the 4 Pounds, take the 4th part of that Quotient, and add them together for the whole *Tare.*

If the *Tare* be 8, 10, or 12 lb. *per Cent.* or any lesser Number; then take the Half of the *Gross Weight*, which will make it Half-Hundreds; then 8 lb. is the 7th part of ½ C. 10 lb. is divided into the 7th part, and 4th of that 7th part; 12 lb. into the 7th part, and half of that part, &c.

Oil is entered at the *Custom house* by the Gallon, and pays Duty accordingly; yet in uncertain Casks it is weighed, and the *Tare* allowed is 18 lb. *per* C. which being deducted, is computed at 7 lb. ½ *per* Gallon; and reduced

reduced thus: Multiply by 94, (that being the Neat Weight of 112) and the Product is the Neat Pounds, which doubled brings them into half Pounds, which divide by 15, the half pounds in 7 Gallons and $\frac{1}{2}$, the Quotient gives the Content in Gallons, which, if divided by 252, gives Tuns, &c.

Example.

	C.	*qrs.*	lb.	
Reduce	124	3	16	into Gallons.

```
        94
   ---------
       496
     1116
       100
   ---------
     11756 Pounds.
         2
   ---------
15)23512(1567 7/15 Gallons.
   1/2 Pounds.
   ---------
      (7)
```

Oil in certain Casks, 1 in 20 is allowed for Leakidge, but under 10 none.

In *Candy* Barrels the *Tare* is 29 lb. *per* Barrel; and from *New England* 50 lb. *per* Barrel.

Admit

Admit 50 Barrels of *Oil* from *New England*, to contain 122 C. 3 *qrs.* 12 lb.

```
           122 C.  3 qrs.  12 lb.
    122
   122
  122,96
  ------
  13760 Pounds.
   2500 Tare.
  ------
  11260 Neat.
  11260
  ------
15)22520( Half Pounds.
  ------
Anſ. 1520 ⅓ Gallons.
  ------
```

Or Pounds of *Oil* are reduced into Gallons by multiplying the Neat Pounds by 2, and dividing that Product by 3; and that Quotient again by 5, gives the Neat Gallons of 7 lb. $\frac{1}{2}$ *per* Gallon.

TARES.

	C.		C.	
Tare of Sugars from	8	to	19	1
	12		15	$1\frac{1}{4}$
	15		17	$1\frac{1}{2}$

Oil 18 lb. *per C.*

Madder in Bales, 28 lb. *Tare per* Bale.

Ditto in Fats, or Vates, 10 lb. *per C.*

Alom, in Casks, 12 lb. *p. C.*

Pot-Aſhes, 10 *ditto.*

Argil, or *Argol*, in Casks, 14 *ditto.*

Almonds in Bags, 14 *ditto.*

Raiſins in Frails or Baskets. 44 lb. *per* Frail.

Many more Examples might be offer'd, but thoſe foregoing I think are ſufficient for the Service and Improvement of any ingenious Perſon.

CHAP.

CHAP. VIII.

The GOLDEN RULE: *Or* Rule of Three *Direct.*

THis is called the *Rule of Three*, from its having Three Numbers to work with to find a Fourth in Proportion to them; which fourth Number is the Answer to the Question.

It is also called the *Golden Rule*, from its excellent Use and Performances in *Arithmetick*.

And sometimes the *Rule of Proportion*, because the fourth Number bears the same Rate or Reason to the Third, as the Second to the First.

I. Observe that of the three given Numbers in any Question of this *Rule*, you have two of them always of one Name, or Kind; that is, if one be *Money*, so is the other; or if one be *Weight*, the other is so also: And one of which Numbers must be the First Number in Stating, and the other the Third; and that must always be the Third which moves the Question, and the other of the same Kind, must be the First Number; and the other Number, which is of another Denomination, always possesses the middle Place, and is evermore of the same Kind with the Answer, or fourth Number sought. As for *Example*.

If 12 Ells of *Holland* cost 36 *s.* what will 456 Ells cost at that Rate?

Here in stating the Question for the Work 456 must be the Third Number, because that is the Number that asketh the Question; for 'tis required to know what will

456

456 Ells cost ? And the other Number of the same name, is to be the first, which here is 12 ; and the last number, which is of the same Kind with the number sought, or Answer to the Question, possesses the middle Place, and when stated for the working stands thus :

Ells		*s*		*Ells.*
If 12	cost	36,	what	456?

II. When ever it happens, that either one, or both of the extreme numbers, be of divers Denominations, they must be reduced into the lowest name mentioned ; that is, if they be *Pounds*, *Shillings*, and *Pence* ; or *C. qrs.* and *lb.* then they must be reduced into Pence, or Pounds Weight. And if one of the Extreams be of several Denominations, and not the other, yet must both be reduced into one Name ; that is, if one consists of *Pounds*, *Shillings* and *Pence*, and the other only of *Pounds*, yet that number which is only Pounds, must be brought into Pence as well as the other, that the first and third numbers may be of like name, which always must be ; that is, if the first number be Feet, the third number must be Feet likewise ; and if one be Gallons, the other must be Gallons also, &c. as was said before. If the middle Number be of divers Denominations, it must be reduced into the lowest mentioned therein (or lower if there's Occasion) as well as the first or third numbers..

III. When the numbers are disposed in such Order, as before directed, and stated accordingly, then multiply the second and third numbers together ; that is, the third by the second, or the second by the third, (it being all one) and divide that Product by the first number, and the Quotient of that Division will be the Answer, and in the same name with the middle number ; that is, if the middle number be Shillings, so will the Quotient also. Or if the middle number be Pence or Farthings, so likewise will be the Quotient, or Answer.

For the better understanding the foregoing Notes and Directions, I shall comprise them under these short Heads following, *viz.*

1. That must be the third Number, which asketh the Question.

2. First and third Nnmbers must be of one Name, or so reduced.

3. The middle Number, if of divers Denominations, must be brought into the lowest mentioned; or lower, if Occasion require it.

4 Multiply second and third Numbers together, and divide that Product by the first Number, and the Quotient thence arising, will be the Answer to the Question, in the same name you left your middle number in.

The fourth number, or Answer to the Question, if in a direct Proportion, may be found these three several Ways, *viz.*

(1.) By multiplying second and third numbers together, and dividing the Product by the first, and the Quotient will be the Answer: As in the 4th Direction above.

[illegible] By dividing the second number by the first, and [illegible] multiplying that Quotient by the third, and that Product will be the number sought.

(3.) By dividing the third by the first, and then multiplying that Quotient into the second number, and that Product will be the Answer.

Tho' all these Ways be equally true, and the two last very concise when either the second or third Terms may be divided by the first, yet the first is most in use.

N. B. *When the first Term is an Unit, the Answer is found by* Multiplication *only. When the second or third Term is an Unit, then the Answer will be found by* Division *only*

Exam-

Example 1.

If 12 Ells of *Holland* cost 36 Shillings, what will 456 Ells cost at that Rate?

The Numbers being ranked according to the Directions given in the first Rule of this Chapter, they stand thus;

```
     Ells      s.      Ells
   If 12 cost 36, what 456?
                        36 Second Number
                      ----
                      2736
                      1368
                      ----
The first Number, 12)16416
                     -----
                 2|0) 136|8
                 ----------
                 Ans. l. 68  08
```

Here (according to Rule) I multiply the third Number 456 by 36, the second Number, and the Product is 16416, which I divide by 12, the first Number, and the Quotient is 1368, which are so many Shillings; because the middle Number was left in Shillings: Then them Shillings in the Quotient I bring into Pounds, according to the Rule given in *Reduction*, page 129, by cutting off the Figure towards the Right Hand, and halving those towards the Left, and the Answer is 68 *l.* 8 *s.* as may be seen in the Work above

Example 2.

If 456 Ells of *Holland* cost 68 *l.* 8 *s.* what will 12 Ells cost at that Rate? *Stated thus as follows.*

	Ells	*l.*	*s.*	Ells
If	456 cost	68	8, what	12?

```
        20
      ----
      1368
        12 Third Number.
      ----
First Number, 456)16416(36 s. Answer.
      1368
      ----
      2736
      2736
      ----
```

(6)

Here the Question lies upon 12 Ells, ; for it is asked, *What will 12 Ells cost?* Therefore, in the stating, it is the third number, (as it is also in the Question, but sometimes it does not so happen, that the numbers in a Question lie in such Order as they ought to do in stating) and the other of the same name is the first, *viz.* 956 ; and the middle number is of the same name you seek for, *viz.* Money, for we want to know how much Money 12 Ells will cost? but here the middle number is of more Denominations than one, *viz.* of *Pounds* and *Shillings* ; and therefore it is brought into the lowest name mentioned, to wit, *Shillings*. Then I multiply second and third numbers together, and divide their Product by the first, and the Quotient is the Answer, *viz.* 36*s.* and is a Proof to the first *Example*. And so may any Question be proved by stating it reversely, or otherwise varying the Question several Ways.

IV. If after you have divided the Product of the second and third numbers multiplied together by the first number, any thing remains, the Value of that Remainder may be found, by multiplying the said Remainder by the Parts of the next inferior Denomination, that are equal to one of the Quotient : That is, suppose the Quotient is Shillings, and there is a Remainder, that Remainder must be multiplied by 12, because 12 of them, *viz.* *Pence*, (the

(the next lower Denomination, make one of the Quotient, to wit, a Shilling; and divide that Product by your former Diviſor, the firſt number, and the Quotient will be the Value of that Remainder, in the Parts aforeſaid. And if any thing yet remain, it muſt be multiplied by the Parts of the next inferior Denomination, that are equal to a Unit of the laſt Quotient, and ſtill divide by the ſame Diviſor, &c. And ſo muſt you proceed till nothing remains, or till you have brought it as low as you deſire.

Example 3.

If one Hundred Weight of *Currants* coſt 2 *l.* 09 *s.* 6 *d.* what will 45 C. 3 qrs. 14 ℔ coſt at that Rate? *Stated as follows.*

	lb		l	s	d		C	qrs	lb
If	112	cost	2	9	6	what	45	3	14?

20 | 4

49 | 183
12 | 28

594 2d Numb. | 1468
367

5138 Third Number.
594 Second Number.

20552
46242
25690 | 12)
27249 Pence.

The first Number 112)3051972
224 .... 2|0)227|0-9d.

811 Ans. l. 113-10-9d $\frac{3}{4}$
784

279
224

557
448

1092
1008

84 Remainder.
4

112)336 ($\frac{3}{4}$
336

(0)

Here

Here the third number is brought into the loweſt name mentioned, *viz.* Pounds ; therefore the firſt number, 1 hundred Weight, muſt be in Pounds alſo. Likewiſe the middle number is brought into the loweſt name mentioned in that. Then the ſecond and third numbers are multiplied together, and that Product divided by the firſt ; and the Quotient is Pence, becauſe the middle number was reduced into Pence ; then the Pence in the Quotient are brought into Pounds by *Reduction* ; and they make 113 *l.* 10 *s.* 9 *d.* But there is a Remainder of 84 ; wherefore I conclude that makes ſomething more ; therefore I multiply that Remainder by 4, the Parts of the next inferiour Denomination, and divide that Product by the former Diviſor, *viz.* 112, and it quotes 3, which is three Farthings, and nothing remains. So that the whole is 113 *l.* 10 *s.* 9 *d.* $\frac{3}{4}$. See the Work.

Exam-

Example 4.

If 15 Weeks Pay comes to 2 *l* 12 *s* 6 *d* what is that a Year? *Stated thus*:

```
         Weeks          l   s   d      Weeks
      If  15    give    2   12  6, what 52 ?
                        20
                        --
                        52
                        12
                       ---
                       630 2d num.
                        52 3d num.
                      ----
                      1260
                     3150
                     -----  12)
 1st numb. 15)32760(  2184 Pence
               30...  --------
               --     2|0)18|2
                27    --------
                15      l 9 - 2 Answer
                --    --------
               126
               120
               ---
                60
                60
                --
               (0)
```

Example

Example 5.

If one Ounce of Silver be valued at 5*s.* 2*d.* what is the Value of 240 Ounces 15 dwt.

If 1 *oz.* cost 5 *s.* 2 *d.* what 240 *oz.* 15 *dwt.*

```
   20                          20
  ----                      --------
  20 Penny Wts. 12/62       4815 Penny Weights.
                              62 2d Number.
                           ------
                            9630
                           28890
                           -----
      1st Number, 2|0)29853|0
                      ---------
      10 Rem.       12)14926 10/20
       4 Farth.     -----------
      --             2|0)124|3-10 d.
   2|0)4|0          ------------
   -------       Answ. l. 62 - 3 - 10 2/4
     2 qrs.          ------------
```

Example 6.

If a Tun of Wine cost 56 *l.* 14 *s.* what costs a Quart?

```
Hbds.          l.  s.——  qt.                       d.
If 4 ———————— 56-14 ——— 1          1008)13608(13 1/2 Ans.
  63            20                      1008
 ----         -----                     ----
  252          1134                     3528
    4            12                     3024
 ----         -----                     ----
1008 qts.    13608 Pence.                504
                                           4
                                        ----
                                   1008)2016(1/2
                                        2016
                                        ----
                                         (0)
```

 Here

Here the middle Number is reduced lower than is mentioned, that being but Shillings, but I have brought it into Pence, because I would have the Anſwer the ſooner, by not having ſo many Remainders to reduce lower. Here alſo the ſecond and third Numbers are not multiplied together, becauſe 1 would only produce the ſame Figures again; wherefore I only divide the ſecond Number by the firſt, and the Quotient is the Anſwer in Pence, agreeable with the middle Number, and the Remainder 504, I multiply by 4, and divide again by 1008, according to the Rule, and the Quotient produces two Farthings more, to be joined to the 13 *d.* So the Anſwer is 13*d.* $\frac{1}{2}$ the *Quart*, as by the Work may be ſeen

Example 7.

Suppoſe my Salary be 73 Pounds a Year, what is that a Day?

```
     Days      l.     Day?
If  365  give  73  what 1?
               20
            ------
      365)1460(4s. per Day, Anſwer.
          1460
          ----
           (0)
```

Here the Year is brought into Days, that the firſt number may agree with the third; and here alſo, I do not multiply by 1, for the Reaſons abovesaid; (for a Unit of it ſelf neither multiplies or divides) and I cannot divide 73 by 365; wherefore I bring the Pounds into a lower Denomination, *viz.* Shillings, or lower, if there be Occaſion. Then I divide according to Rule, and the Quotient gives 4*s.* the Day for Anſwer, agreeable to the ſecond Aſſertion of *N. B.* in page 160.

Example 8.

Nutmegs at $4^d\frac{1}{2}$ *per* Ounce, what is that the C. Wt?

oz.	*d.*	*lb.*
If 1 cost	$4\frac{1}{2}$, what	112 ?
	4	16
	18	672
		112
		1792 Ounces.
		18 Second number.
		14336
		1792
		4)32256(Farthings.
		12)8064
		2|0)67|2
		l. 33 - 12 Answer.

Here the middle number is reduced into the lowest name mentioned, *viz.* Farthings, by which I multiply the third, and the Product is Farthings; and according to Rule, I should divide by the first number, but the first number being 1, it neither multiplies or divides, (as was said before) and therefore the Quotient, or 4th number, is the same with the Product of the second and third, which is Farahings; because the second number was Farthings, which are reduced into Pounds, as above.

I shall now shew, that many times Questions in this Rule may be contracted, and much sooner wrought by another Method of working; that is only by following the brief Methods of *Multiplication* and *Division*, sufficiently shewn in the 4th and 5th Chapters of this Book.

Example

Example 9.

If 5 Gallons of Brandy cost 1 *l.* 6 *s.* 8 *d.* what will 63 Gallons, or a Hogshead, cost at that Rate ?

The common Way.

```
  G.   l.  s.  d.   G.
If 5———1   6   8———63
      20
     ———
      26
      12
     ———
     320 2d Numb.
      63 3d Numb.
    ————
     960
    1920
    ————
  5)20160
  ———————
 12)4032 Pence.
  ———————
 2|0)33|6
  ———————
 l. 16 - 16 Answer.
```

The shorter Way.

```
             G.   l.  s.  d.   G.
           If 5———1   6   8———63
                          9
                   ————————
                  12  0   0
                          7
                   ————————
   1st Num. 5)84  0   0
                   ————————
     Answ. l. 16  16  0
```

In working by the shorter way, I do not reduce the middle Number at all, but multiply according to the 14th Rule of the 4th Chapter of this Book, by 7 and 9, they multiplied together making the Quantity 63, which Product I divide by 5, the first number, according to the 10th Rule of the 5th Chapter, and the Quotient is the Answer, *viz.* 16 *l.* 16 *s.* as in the common way. Here in this short Method, the Rule of Stating and Working is followed, as in the common way ; for the second and third numbers are multiplied together, and their Produce divided by the first, but there is above 20 Figures difference between one way and the other.

Example

Example 10.

If the Wages of 3 Weeks comes to 2 *l.* 3 *s.* 6 *d.* what is a Years Wages at that Rate ?

Common Way.

W	l	s	d	W
If 3 —	2	03	6 —	52
	20			
	43			
	12			
	522 Second.			
	52 3d.			
	1044			
	2610			
	3)27144			
	12)9048 Pence			
	2|0)75|4			
	l 37-14 Answer			

Short Way.

	W	l	s	d	W
	If 3 —	2	03	6 —	52
				10	
		21	15	0	
				5	W.
		108	15	0	50
l 2 3 6 M. by (2)		4	07	0	2
1st N.3)		113	02	0	52
Ans.		*l* 37	14	0	

After I have multiplied by 10, and by 5, which make Fifty, I multiply 2 *l* 3 *s* 6 *d* the Middle number, by 2, which is wanting, and add them together.

Example

Example 11.

If 56 lb. of Coffee cost 21 *l.* 11 *s.* 8 *d.* what will 3 lb. cost at that Rate?

Common Way.

lb.	*l.*	*s.*	*d.*	
If 56 ——	21	11	8 ——	what 3 *lb.*

20
431
12
5180 Second.
3 Third.
—— 12)
56)15540(277
112
2|3-1 $\frac{1}{2}$
434
392 *l.* 1 03 1 $\frac{1}{2}$ Answ.
420
392
28 Remaind.
4
56)112(2
112
(0)

Shorter Method.

If 56 —— 21 11 8 —— 3
3
7)64 15 0
8)8 05 6
Ans. *l.* 1 03 1 $\frac{1}{2}$

Here I divide by the first number at twice, according to the 11th Rule of the Vth Chapter. Here is above 30 Figures difference.

Example

Example 12.

If the Freight of a Ship be 529 *l.* 11 *s.* what must be given to A. B. for his $\frac{5}{32}$ Parts?

```
Pts.         l.   s.        Pts.
If 32—give 529   11——what 5?
              20
         ———————
           10591
               5
         ———————
  32)52955(165|4
     32...
     ———
     209
     192
     ———Ans. l. 82  14  10 4/32, or 1/8, or half a
     175                                    Farth.
     160
    ————
     155
     128
     ———
Rem.  27
      12
    ————
  32)324(10
      32
      ——
Rem. (4)
      ——
      32
```

```
Pts.  Short Way.    Pts.
If 32——l. 529   11——5
                     5
      ———————————————
      4)2647   15
      ———————————
      8) 661   18   9
      ———————————————
Ans. l. 82  14  10  0 1/2 a far.
```

Here is almost 40 Figures difference.

Example 13.

If 72 C. of Starch cost 63 *l.* what will 15 C. at that Rate?

	C.	l.	C.	
If	72 ——	63 ——	15?	Answer *l.* 13 : 2 : 6

Short Way.

	C.	l.	C.
If	72 ——	63 ——	15
		3	
		189	
		5	
		8)945	
		9)118 $\frac{1}{8}$	
		l. 13 : 2 : 6	

☞ Note, *If at any time we know but what Part the second Number is of the first; the same Part also will the* 4th *Number (or Answer) be of the third.* As for Example.

If 10 *s.* gain 2 *s.* what 100 *l.* *Answer* 20 *l.* Which is the 5th Part of 100, as 2 is of 10.

Another Short Way.

There is another Way of contracting Questions in this Rule, *viz.* by dividing the third Number by the first; and by that Quotient to multiply the second, which Product, or Products, will be the Answer; as in the following Examples.

Ex-

Example 14.

If 8 Yards of Cloth cost 4 *l.* 10 *s.* 8 *d.* what will 24 Yards at that Rate?

Common Way.

```
   Yds   l   s   d   Yds
If 8----4   10   8----24?
       20
    -----
       90
       12
    -----
     1088
       24
    -----
     4352
    2176
    -----
  8)26112
    -----
 12)3264
    -----
 2[0)27[2
    -----
Anf. l. 13-12
```

Second short Way.

```
   Yds   l   s   d   Yds
If 8----4   10   8----24(3 Q.
                 3
          ---------
Anf. l. 13   12  0
          ---------
```

Here I divide 24, the third Number, by 8, the first Number, and it quotes 3; by which I multiply 4 *l.* 10 *s* 8 *d* the middle number, and the Product is the Answer, *viz.* 13 *l.* 12 *s* 0 *d* as before. But if the Question had been stated contrariwise, *viz.* If 24 *Yds.* cost 13 *l* 12 *s* what 8 *Yds*? Then you might have done it by the other short Way, as follows.

If

	Yds.	*l.*	*s.*	*Yds.*
If	24 cost	13	12, what	8 ?
			8	
	8)108	16		
	3)13	12		
	Ans. *l.* 4	10	08	

Or thus :

l. 108	16	
8)36	05 $\frac{1}{2}$	
As before *l.* 4	10	8

Or divide the first number (when that is greatest) by the 3d, and by that Quotient divide the 2d, and that last Quotient is the Answer, as under.

	Yds.	*l.*	*s.*	*Yds.*
If	24 cost	13	12, what	8 ?
	3	3)4	10	8 Ans.

When any thing remains (in the second short Method) after you have divided the third number by the first, then the first and third numbers are not proportional ; for if they be, there will remain nothing. In this Case, I say, when any Thing remains, you must, after you have multiplied the middle number by the Quotient, or whole number ; then multiply also the middle number by the *Numerator* of the Fraction in its lowest Terms, and divide that Product by the *Denominator*, and add that Quotient to the former Product of the second number multiplied by the Quotient, or whole number aforesaid. An Example or two, will make it easy to be understood.

But before I proceed, 'twill be necessary a little to explain the Meaning of the *Numerator*, and *Denominator* of a Fraction, and how to reduce it into its lowest Terms.

A Fraction, or Part of a whole number, arises from *Division* ; and what remains after the *Division* is ended, is the *Numerator*, and the *Divisor* is the *Denominator*. As suppose your Divisor is 12, and your Remainder 4, then 4 is the *Numerator*, and 12 the *Denominator* ; and if set *Fraction-wise*, stand as follows.

Re-

$$\begin{array}{lcl} \text{Remainder} & 4 & \text{Numerator} \\ \hline \text{Divisor} & 12 & \text{Denominator} \end{array}$$

And to reduce this (or any other Fraction) into its lowest Terms, halve the Numerator, and also the Denominator; or divide them by 3, 4, 5, &c. or by any of the 9 Digits, that nothing remain in either; for that Figure which divides one without a Remainder, may not do so by another, but you must divide both Numerator and Denominator by such a Number as leaves no Remainder in either. But if you cannot do so, then is the Fraction in its lowest Terms already.

Example.

Reduce the aforementioned Fraction $\frac{4}{12}$ into its lowest Terms.

$$\tfrac{2}{2}\ \left\{\frac{4}{12}\right\}\frac{2}{6}\left\{\frac{1}{3}\right\}\ \textit{Lowest Terms.}$$

$$\tfrac{4}{4}\ \left\{\frac{4}{12}\right\}\frac{1}{3}\ \}\ \textit{Lowest Terms.}$$

Here I reduce it, by dividing it by 2, or halving it, saying the half of 4 is 2, and the half of 12 is 6: Then again, the half of 2 is 1, and the half of 6 is 3; which is as far as I can go, and the Fraction is reduced into its lowest Terms, *viz.* $\frac{1}{3}$. But if I divide it by 4, it reduces it sooner; for I say the 4's in 4 once, and the 4's in 12 3 times: And so it is reduced at once into $\frac{1}{3}$, as *per* Work. And this $\frac{1}{3}$ is equal in Value with $\frac{4}{12}$, for as 1 is the 3d part of 3, so is 4 of 12.

Example

Example 15.

If in 15 Weeks I spend *l.* 5-5, what is that a Year?

Common Way.

W. *l.* *s.* *W.*
If 15—5 5—52
20

105
52

210
525

15)5460)36|4
45..

96
90 *l.* 18-4 Anſ.

60
60

(0)

Short Way.

W. *l.* *s.* *W.*
If 15—5 5—52 (3 $\frac{7}{15}$
3

15 15
2 9

Anſ. *l.* 18 4

3) 36 15

5) 12 05

2 09

Here I divide 52 the 3d number, by 15 the firſt number, and it quotes 3, and the Remainder is 7, by which 7, after I have multiplied by 3, I multiply *l.* 5-5 the middle number, and the Product is *l.* 36-15, which I divide by 15, the firſt number, at twice, and the laſt Quotient is *l.* 2-9, which is $\frac{7}{15}$, Seven Fifteenths of *l.* 5-5, which is added to the *l.* 15-15, the Product of *l.* 5-5, multiplied by the Quotient 3, and they make *l.* 18-4, as by the common Way. See the Work.

Example 16.

If 45 *l.* buy 15 *C.* $\frac{1}{4}$ 12 ℔ of *Mather*, what will 20 *l.* buy at that Rate?

Common

Common Way	*Short Way*
l. C. qrs. lb. *l.*	*l.* C. qrs. lb. *l.*
If 45—15 3 12—200	If 45—15 3 12—200(4
	4—180
Ans. 70 1 25	
	63 1 20 } (26
	} 5 — 4/5

C. qrs. lb.
The 4/5 of 15 3 12 ——— 7 0 05 } (45

70 1 25 Answer

C. qrs. lb.
45)355200(7893 (70 1 25 Answer.

Here I divide the third Number 200, by 45, the first number, and it quotes 4, by which I multiply the middle number, C.15-3-12, and the Product is C. 63-1-20. But there is a Remainder of $\frac{20}{45}$, which, in its lowest Terms, is 4 fifths; wherefore I take the $\frac{4}{5}$ of the middle number, that is, by multiplying by 4, and dividing by 5; according to Rule, and there is produced C.7-0-5 more; to be added to C. 63-1-20, and the Total is C. 70-1-25.

Example 17.

If 26 Yards of Broad Cloth cost *l.* 12-2-8, what will 248 Yards cost at that Rate?

Yds. *l.* *s.* *d.* *Yds.*
If 26—12 2 8—248?
20
———
242
12
———
2912 *Ayre*'s Arith.
248 p. 105.
———
23296
11648
5824
————12)
26)722176(27776 Pence.] *l.* 115-14-8 Answ.

Short

Shorter Way

```
If 26———12  2  8————248(9
               9    234
       ———————————  ————
       109  04  ●    14| 7
  7/13   6  10  8    ——|——
       ———————————   26|13
  l. 115  14  8 Answer
       ———————————
  13) 84  18  8
       ———————————
To be added, 6  10  8
```

Example 18.

If 27 Acres of Land let for 17 *l.* 10 *s.* what will 135 Acres come to at that Rate?

```
 Ac.      l.    s.       Ac.
If 27————17    10————135
          20
         ———
         350
         135
         ———
        1750
        1050
        350
        ———2|(0)
  27)47250(175|0
     27    ——————
     ——  l. 87 10
     202  ——————
     189
     ———
     135
     135
     ———
     (0)
```

Shorter Way

```
If 27——17  10————135(5
            5     135
      —————————   ———
Answ. l. 87  10   (0)
      —————————
```

Thus

Thus by one of these short Ways, may most Questions in this Rule be answered, and much Time, and many Figures saved. I shall now only add some Questions, with their Answers, for the Learner's Practice.

19. If 18 Yards $\frac{3}{4}$ of Serge cost 2 *l.* 5 *s.* how many Yards of the same may I have for 300 Guineas at 21*s* 6*d* each? Answ. 2687 $\frac{1}{2}$ Yards.

20. If 37 Acres of Land let for *l.* 13-11-4, what is that an Acre? Ans. 7*s* 4*d.* *per* Acre.

21. If I have an Estate of 470 *l.* *per Annum*, what may I expend daily, and yet lay up yearly 130 *l.* Answ. 18*s* 7*d* $\frac{1}{2}$ $\frac{90}{365}$.

22 How many Dozen of Stockings, at 11 Groats *per* Pair, may I buy for *l.* 190-12? Ans. 86 Doz. 7 Pr. $\frac{32}{44}$.

23. Bought 6 Chests of Sugar, each 6 C. $\frac{3}{4}$, at 56 *s.* *per* C. what come they to? Answ. *l.* 113-8.

24. Sold a piece of Cloth, *qt.* 29 $\frac{1}{2}$ Yards, for *l.* 5-17, what is that *per* Ell *English*? Ans. 4*s* 11*d* $\frac{1}{4}$ $\frac{114}{118}$.

25. *A* owes *B* *l.* 296-17, but he compounds for 7*s* 6*d.* in the Pound, what must *B* receive for his Debt? Ans. *l.* 111-6-4$\frac{1}{8}$.

26. If the Interest of 100 *l.* for a Year, comes to 6 *l.* what is the Interest of *l.* 315-12-6, for the same Time? Ans. *l.* 18-18-9.

27. Bought a Cask of Wine for *l.* 62-8, how many Gallons were in the same, when the Gallon was valued at 5 *s.* 4 *d.* Answ. 234 Gallons.

28. What comes the Commission to, of *l.* 490-12, at *l.* 2 $\frac{1}{2}$ *per Cent.* Ans. *l.* 12-5-3 $\frac{1}{2}$.

29. If the whole of a Ship cost *l.* 1270-10, what doth $\frac{3}{32}$ Parts come to at that Rate? Ans. *l.* 119-2-2 $\frac{1}{4}$.

30. If *A* owes *B* *l.* 395-18, but compounds the whole Debt for *l.* 100-12, what is that in the Pound? Ans. 5 *s.* 1 *d.* almost, or *s.* 5-0 $\frac{3}{4}$, $\frac{7446}{7918}$.

31. What comes C. 19-2-12 of Sugar to, at 5 *d.* $\frac{1}{2}$ *per* Pound? Ans. *l.* 50-6-6.

32. Arrived from *Turkey*, 246 Bales of *Tripoly Belladine* Raw Silk, weighing one with another, C. 2 $\frac{3}{4}$ at *s.* 18-6, the Pound, of 24 Ounces, what do they amount to? Ans. *l.* 46723-12.

33.

33. If I have *l.* 214 a Year, what is that for 19 Weeks? Answ. *l* 78-3-10 $\frac{8}{52}$.

34. What comes the Insurance of *l* 642-12-6 to, at 4 Guineas *per Cent.* the Guineas at 21 *s* 6 *d.* Answer *l* 27-12-7 $\frac{1}{2}$

35. If I buy a 100 Yards of Ribbon, at 3 Yards for a Shilling, and 100 of *ditto*, at 2 Yards for a Shilling, and sell it again for 2 Shillings the 5 Yards, the Question is, *Whether I get or lose, and how much?* Ans I lose 3 *s.* 4*d.*

36. Shipt for *Jamaica*, 550 pair of Silk Stockings, at *s* 11-6 *per* pair, and 460 Yards of Stuff, at 14 *d. per* Yard; in return of which I have had C. 46 $\frac{3}{4}$ of *Sugar*, at *s* 24-6 *per* C. and 1570 ℔ of *Indigo*, at *s* 2-4 *per* ℔ what remains due to me of my *Adventure*? Answer *l* 102-12-11 $\frac{1}{2}$.

Exported,	343	01	8
Imported,	240	08	8 $\frac{1}{2}$
Difference,	102	12	11 $\frac{1}{2}$

37. How long will 1000 *l* last me, if I spend no more or less, than 3 *s* 6 *d. per* Day? Answer 15 Years, 7 Months, (accounting 30 Days to the Month) and 29 Days, $\frac{12}{42}$, $\frac{2}{7}$.

38. Shipt for the *Straits*, 100 Pigs of Lead, *qt.* C 283 $\frac{3}{4}$ 12 ℔ at *l* 10-17 *per* Fodder, of C 19 $\frac{1}{2}$, what come they to? Answer *l* 157-18-9 $\frac{1860}{2184}$.

To Rate Town Taxes.

39. Suppose *A* hath an Estate of 53 *l* a Year, and payeth *s* 5-10 to the Subsidy, what shall *B* pay, whose Estate is worth 100 *l per Annum*? Answ. 11 *s* $\frac{4}{53}$.

40. Admit a Tax or Rate of 39 *l* is laid on a Town for the building of a Bridge; and the Value of the *Town Rent* is 900 *l per Annum*, what is each Man's Proportion to pay, according to his Rent? If one Man in the Town be worth 100 *l* a Year, what shall he pay to the said Rate, or 39 *l*? Answer *l* 4-6-8.

Profit

Profit and Loss.

41. If I buy a Tun of Wine at 9 *l.* *per* Hogshead, and fell it again at 13 *l.* *per* Hhd. what do I gain *per Cent.*? Anf. *l.* 44-8-10 $\frac{2}{3}$, $\frac{6}{9}$ or $\frac{2}{3}$.

Company.

42. Two Partners join Stocks for a certain Time, *A* puts in 250 *l.* *B* 430 *l.* and in Trade they have gained 340. *l.* what muft each Man have of the Profit, in Proportion to his Money in Company?

l. 250 A.
530 B.

If *l.* 680	— *l.* 340	— *l.* 250	Anf.	*l.* 125
If 680	— 340	— 430		215
			Proof,	340

Barter.

43. How many Dozen of Candles, at 5 *s.* 2 *d* *per* Doz. muft I give for C. 3 $\frac{1}{2}$ of Tallow, at 37 *s.* 6 *d.* *per* C? Anf. 25 Doz. $\frac{19}{62}$.

Whereas a Noble *and a* Mark, *juft* 15 *Yards did buy,*
How many Ells of the fame Cloth for 50 *Pounds had I?*
Anf. 600 Ells.

If 15 *Pounds coft* 16 *Pence, of Bread that's made of Rye,*
How many Loaves, of 6 *Pounds each, for Fourfcore Pounds had I?*
Anf. 3000.

If 5 Tuns of Logwood cost 56 Pounds,
How many full Hundreds for 96 Crowns?
Answ. 42 *C.* 3 *qrs.* 12 ℔.

If 15 Hundred of our Lead cost 16 Pounds in Gold,
How much of that Saturnian *Ore for 40 Pounds is sold?*
Ans. C. 37 $\frac{1}{2}$

If 30 Pence, and 40 Groats, buy 50 Pints of Wine.
What is the cost of 60 Quarts in current English *Coin?*
Ans. 38 Shillings.

If 9 Pounds of our English *Wool, doth 90 Pence require,*
The Value of 1 C. *Weight of you I do desire?*
Ans. 4 *l.* 13. *s.* 4 *d.*

If the half of a Mark *buy the Fourth of a Pound,*
How much Cocheneal *can I have for a Crown?*
Ans. 3 Ounces.

If 16 Shillings and a Crown, for 13 Weeks Supply,
For Meat and Drink, that is, my Board, how much a Day gave I?
Ans. 2 *d.* $\frac{3}{4}$. *per* Day.

If that a Rule of 3 Foot long doth give 5 Foot in Shade,
And if a Steeple 99, how high in Feet is't made?
Ans. 59 Feet $\frac{2}{5}$.

To prove the Rule of Three Direct.

Multiply the fourth Number, or Answer to the Question, by the first; then multiply the second and third Numbers together, and if the Product be alike, the Work is right.

For Tryal of which, let us prove the first Question in this *Rule*, which was,

If 12 Ells cost 36 *s.* what 456 Ells?

And

And the Answer there found, or fourth Number, was 1368 Shillings; the which multiplied by the first Number 12, produces 16416; then multiply also the second and third Numbers together; to wit, 36, and 465, and the Product is also 16416, wherefore the Answer is right.

But observe well, that when there is any Remainder, after you have divided the Product of the second and third Numbers, by the first, such Remainder must, in the Proof, be added to the Product of the first and fourth Numbers, which must be equal to the Product of the third Number, multiplied by the second.

Or, Examples may be more intelligibly prov'd by varying the Question, thus:

If 456 Ells cost *l.* 68-8 what 12 Ells? Ans. 36 s.

As in the second *Example* of this Rule.

CHAP. IX.

The Rule of Three Inverse.

I. IN this Rule, the 4th Number sought, bears the same Proportion to the first, as the second does to the third Number.

II. The Stating of the Question in this Rule, differs not from the Method of Stating in the *Direct Rule*; for the Number that asketh the Question, must be the third Number here, as well as there, &c. And to know when the Question belongs to this *Rule*, and when to the *Direct*, observe this General Rule.

When the Question is stated, consider whether the 4th Number, or Answer, ought to be more or less than the second Number, (which is easily known) if more, then

 the

the least of the two Extreams must be your Divisor; but if it ought to be less, then the biggest of the two Extreams must be your Divisor. [*Here the first and third Numbers are called Extreams, with respect to the second.*] If the first Number is the Divisor, then the Question belongs to the *Direct Rule*; but if the third is the Divisor, then the Question pertains to the *Rule of Three Inverse.*

III. In this Rule you must multiply first and second Numbers together, and divide that Product by the third, and the Quotient is the Answer, in the same Name with the middle Number.

In this Rule *Note also*, That when the third Number is less than the first, then the Answer required will be greater than the second.

Or, when the third Number is greater than the first, the Answer will be less than the second.

Example 1.

If 6 *Mowers* can mow a common Field in 12 Days, in what time will 24 *Mowers* do it in? *Answer*, in 3 Days. *Thus Stated.*

If 6——————require 12——————what 24?
6 First Number.

Third Number, 24)72(3 Days, the *Answer.*
72
(0)

Here I consider the fourth Number, or Number sought, requires less than the second; for the more the Hands, the lesser the time, and therefore the greater of the two Extreams must be the Divisor, which is the third Number, therefore the Question is to be answered by the *Rule Inverse.* Wherefore, according to *Rule* the 3d, I multiply first and second Numbers together, and divide by the third, and the Quotient is the Answer, *viz.* 3 Days; as in the preceding Work.

Here

Here, as the third Number contains the second twice, so doth the fourth contain the first, according to the first *Rule* of this Chapter.

Example 2.

If when Wheat is 4 *s.* the Bushel, the 20 Penny-Loaf weigh 18 ℔ what must the said 20 Penny-Loaf weigh when Wheat is 6 *s.* the Bushel? *Answer* 12 ℔

If 4 give 18, what 6?
4
6)72(12 ℔ Answ.

Here also the 4th Number requires less; for the dearer the Wheat, the lesser or lighter the Loaf: So therefore, the greater of the two Extreams, *viz.* 6, is the Divisor, which being the third Number, denominates the Question to be *Inverse*.

Example 3.

Admit I lend a Friend on his Occasion, *l.* 100 for 6 Months, and he promises me the like Kindness when I desire it; but when I came to request it, he could lend me but 75 *l.* the Question is, to know how long I may keep his Money, to recompence my Courtesy to him? *Answer*, Eight Months.

If 100 give 6, what 75?
6
75)600(8 Months, *Answer.*
600
(0)

Here it is apparent, the lesser the Sum, the more the Time; and therefore the lesser Extream is the Divisor, which is 75.

Example 4.

How many Dollars at 4 *s.* 4 *d.* must be given for 360 *Guilders*, at 2 *s.* 2 *d.* *Answ.* 180.

```
      s.  d.                    s.  d.
   If 2   2  give  360,  what  4   4 ?
     12            26         12
    ---          -----       ---
     26           2160        52
                  720
                 -----
              52)9360(180 Dollars.
                 52..
                 ----
                 416
                 416
                 ----
                 (0)
```

Here the more the Value, the fewer the Pieces, and therefore the bigger of the Extreams is the Divisor, which is the 3d Number, and therefore it is *Inverse*.

Example 5.

If 100 *l.* Principal gain 5 *l.* Interest in 12 Months what Principal will gain as much in 5 Months? *Answer*, 240 *l.*

```
     M.        l.        M.
  If 12———————100————————5
                12
              ----
             5)1200
              ------
           l. 240 Principal.  Answer.
```

Exam-

Example 6.

When an Acre of Land doth contain 4 Poles in Breadth, then must it qt. 40 in Length; what must be the Length when there is 13 Poles in Breadth? *Answ.* 12 *P.* $\frac{4}{13}$, or 5 *Foot*, $\frac{1}{13}$. See the Work.

P. Br. P. L. P. B.
If 4 give 40, what 13?

$$
\begin{array}{r}
40 \\
4 \\
\hline
13)160(12 \\
13 \\
\hline
30 \\
26 \\
\hline
4 \\
16\frac{1}{2} \\
\hline
64 \\
2 \text{ the } \frac{1}{2} \text{ of } 4 \\
\hline
13)66(5 \text{ Foot } \frac{1}{13} \\
65 \\
\hline
(1)
\end{array}
$$

Here the Breadth is more, and therefore the Length must be less.

Example 7. A Room 30 Foot long, and 18 Foot wide, is to be covered with painted Cloth, how many Yards of *Holland Duck*, of $\frac{3}{4}$ wide, will cover it?

Answ. 240 Foot, or 80 Yards.

Ex. 8. If a Man performs a Journey in 6 Days when the Day is 8 Hours long, in what Time will he do it, when the Day is 12 Hours long? *Answ.* in 4 Days.

Ex. 9. If 150 Pioneers cast a Trench in 24 Hours, how many must be set on to perform it in 6 Hours?

Ans. 600 Pioneers.

Ex. 10. If a Piece of Grass will graze 56 Oxen 6 Days, how many must be turned out, that it may last the remaining Oxen 16 Days? Ans. 35 Oxen out, 21 stay.

Ex. 11. How much Shalloon, of 3 *qrs.* wide, will serve to line 9 Yards of Cloth, of 7 *qrs.* wide? Ans. 21 *Yds.*

Ex. 12. If 10 Pounds worth of Wine, at 18 *d.* the Bottle, accomodate 30 Men, how many will the said ten Pounds entertain with Wine at 3 *s.* 6 *d.* the Bottle?

Ans. 12 $\frac{36}{42}$ Persons.

Ex. 13. If for 5 *l.* 5 *s.* I have 14 C. Wt. carried 136 Miles, how many Miles may I have 24 C. carried for the same Money? Ans. 79 $\frac{1}{3}$ Miles.

Ex. 14. In 730 *Germans* Rix-Dollars, at 4 *s.* 5 *d.* $\frac{3}{4}$, how many *Venetian* Ducats at 4 *s.* 4 *d.*? Ans. 745, $\frac{113}{208}$.

Ex. 15. How many Pounds of Coffee, at 5 *s.* 9 *d.* *per* lb. is equal in Value to 426 lb. of *Tea*, at 13 *s.* 4 *d.* *per* lb.?

Ans. 987 $\frac{57}{69}$

Ex. 16. If 60 Ells *English*, be equal to 100 Ells *Flemish*, and each Ell *English* contains 20 nails of a Yard, how many such nails doth the *Flemish* contain?

Ans. 12 Nails.

Ex. 17. *If 14 Men, in 15 Days, build 16 Rod of Wall,*
How many Men must added be to do't in 2, that's
all? Ans. 105 Men.

CHAP. X.

The Double Rule of Three Direct.

I. QUESTIONS in this Rule have five given Numbers, to find a sixth in Proportion.

II. Any

II. Any Question in the *Double Rule of Three* may be answered by two *Single Rules of Three*; that is, at two Statings, &c. or by one Rule composed of the five given Numbers.

III. Three of the five given Numbers imply a Supposition, and the other two a Demand.

Example 1.

If 100 *l.* in 12 Months gain 6 *l.* interest, what will 25 *l.* gain in 4 Months?

Here the Supposition lies on the the first Numbers, *viz.* 100, 12, and 6, for it is said, If (or suppose) 100 *l.* in 12 Months gain 6 *l.* Interest; and the Demand lies on the two last Numbers, *viz.* 25 and 4; for it is demanded, what will 25 *l.* gain in 4 Months?

IV. In your first stating, you must observe always to make that the second Number, which is of the same Denomination with the Number required; and one of the other Numbers in the Supposition, (it matters not which) must be the first Number; and that Number in the Demand of the same Name with the first, must be the third Number; and then your first stating will stand thus:

	l. P.	*l. I.*	*l. Principal.*
If	100 gain	6, what	25?

Here the 2d Number is of the same Name with the Number required; for the Interest of 25 *l.* is required; and the second Number is Pounds Interest; and the first Number is Pounds Principal; and so is the third Number 25, being one of the Numbers in the Demand. And being so stated, I work as in the *Single Rule of Three*, thus:

l. P.		l. I.		l. P.
If 100	——	gain 6,	——	what 25 ?
				6
				l. 1|50
				20
				10|00 Answ. 1 l. 10 s.

Here I cut off two Figures towards the Right Hand, which is dividing by 100, according to the Directions given in *Division.*

And now having found the Interest of 25 *l.* by this first Operation, I proceed to the second: And Note always, *That the Answer to the first Stating, is the middle Number to the second*; as thus:

Mo.			s.		Mo.
If 12	——	give ——	30,	——	what 4 ?
			4		
			12)120		
			10 s. Answer.		

Here in the second State, the remaining Number in the Supposition is the first; and the other of the same Name in the Demand, is the third Number, and the middle Number is of the same Name we seek for; *viz.* Interest; and is the Answer to the Question, *viz.* 10 *s.*

And thus, by these two Operations in the *Rule of Three,* I find the Answer to the Question, *viz.* That if 100 *l.* *Principal* in 12 Months, gain 6 *l.* Interest, then 25 *l.* *Principal* will gain ten Shillings Interest in 4 Months.

The same Answer will also be found, if you work after the following Manner:

If 12

If 12 gain 6, what 4?
4
―――
12)24
―――
2 *l.* Answ.
―――

If 100 *l.* gain 2 *l.* what 25 *l.*?
20   s 40 2d Numb.
―   ―――
40   10 | 00 Anf. 10 *s.*
―――   ―――
1|00

The middle Number in the last stating, is brought into Shillings, otherwise I could not have divided by the first Number.

V. The last Question, or any other in this Rule, may be also answered by a Rule compos'd of the five given Numbers; (as was said in the IId Rule of this Chapter) after this Manner: State the Question so, that the Numbers may stand in one continued Rank, and in such Order, that the first and fourth Numbers may be of one Denomination, and the second and fifth.

Then multiply the two first Numbers together, for a Divisor; and the three last together, for a Dividend, and the Quotient will be the Answer, in the same Name with the middle or third Number; for the Tryal of which, let us take the last *Example, viz.*

If

```
      (1)    (2)                  (4)   (5)
      l P.   M.          l. I.    l. P.  M.
If  100 in  12, gain 6, what  25 in  4?
      12            20
    ------        ------
    1200           120
                    25  4th Number.
                  ------
                   600
                  240
                  ------
                  3000
                     4  5th.
                  ------
Divisor 12|00)120|00
                  ------
                    10 Shillings Answer.
                  ------
```

Here the Question is stated, and worked as before directed; and the Answer is 10 *s.* as it was when wrought at two Operations.

If the foregoing Directions are heedfully attended to, they are sufficient for any one's Instruction in the *Double Rule of Three Direct*; and also for the working of any Question therein, by the Rule composed of 5 numbers, and therefore I shall only add some Questions, with their Answers, and so proceed to the next Rule.

Example 2. If 750 Bushels of Oats serve 500 Horses, 5 Days, how many Bushels will serve 1000 Horses 14 Days? Ans. 3500 Bushels.

Ex. 3. If 36 Acres of Grass be mowed by 6 Men in 8 Days, how many Acres will be mowed by 36 Men in 38 Days? Ans. 1026 Acres.

Ex. 4. If 1000 lb. of Beef or Pork serve 250 Seamen 7 Days, how many Pounds of *ditto* will serve 550 Seamen 63 Days, or 9 Weeks? Ans. 19800 lb.

Ex. 5. If a Carrier receive 30 *s.* for the Carriage of 3 C. Weight 150 Miles, what must he receive for the Carriage of 7 C. Weight 50 Miles? Ans. 23 *s.* 4 *d.*

Ex. 6.

Ex. 6. If 100 *l.* in 12 Months gain 5 *l.* Intereſt, what will 63 *l.* gain in 6 Months at that Rate? *Anſwer, l.* 1-11-6.

Ex. 7. If 6 Quarters of Malt are ſufficient for a Family of 12 Perſons, for 3 Months, how many Quarters will ſerve a Family of 24 Perſons 12 Months? *Anſwer,* 48 Quarters.

Ex. 8. If a Perſon takes in 320 *l.* to pay Intereſt for the ſame, and at the End of 12 Months, pays for Principal and Intereſt *l.* 339-4; the Queſtion is, at what Rate *per Cent per Annum* did he pay Intereſt? *Anſw.* 6 *per cent per annum.*

Ex. 9. If 15 *s.* pay 5 Men for 6 Days, how much will pay 20 Men for 10 Days? *Anſwer* 5 *l.*

Ex. 10. If 36 Buſhels of Wheat in one Year yield 216 Buſhels, how much will 36 Quarters yield in 6 Years? *Anſw.* 10368 Buſhels.

CHAP. XI.

The Double Rule of Three Inverſe.

QUESTIONS in this Rule are wrought by two ſingle *Rules of Three,* as thoſe in the foregoing Rule; but you are to obſerve, that one of the Statings (and never but one) will fall out to be *Inverſe,* and muſt be worked accordingly.

Any Queſtion in this Rule alſo, may be anſwered by the Compound Rule of five Numbers; obſerving to make the ſecond and fourth Numbers of like Name, and the third and fifth; then multiply the third and fourth Numbers together for a Diviſor, and the other three remaining numbers together for a Dividend, and the Quotient will be the Anſwer in the ſame name with the firſt number.

Ex-

Example 1.

If 50 Pioneers in 6 Days cast a Trench 30 Yards long, how many Pioneers will cast a Trench 200 Yards long, in 3 Days? *Answ.* 666 $\frac{2}{3}$ Pioneers.

D		Pion.		D.	Yds.		Pion.		Yds.
If 6	require	50	what	5	If 30	require	100	what	200
		6							100
		3)300							3[0)2000[0
		100							666 $\frac{2}{3}$
If 30	require	50	what	200	If 6	require	333 $\frac{1}{3}$	wt.	3
				50			6		
				3[0)1000[0			3)1999		
		Ans.		333 $\frac{1}{3}$			666 $\frac{2}{3}$		

Here the Question is answered by two single *Rules of Three*, two different Ways, as in the foregoing Work may be seen; and the first stating in the first Way falls out to be *Inverse*, and the last in the second Way does the same; for both statings are never *Inverse*, as was said before.

Or it may be done by the compound Rule of five numbers, thus:

	(1)	(2)	(3)	(4)	(5)	
	P.	D.	Yds.	D.	Yds.	
If	50	6	30	3	200	
			3		6	Second.
			90		1200	
					50	First.
					9[0)6000[0	
				Ans.	666 $\frac{60}{90}$ or $\frac{2}{3}$	

Ex-

Example 2. If 100 *l.* Principal in 12 Months gain 6 *l.* Interest, what Principal will gain 18 *l.* in 15 Months?

Answer, 240 *l.*

Example 3. If a Person travels 320 Miles in 10 Days, when the Day is 12 Hours long, in how many Days may he travel 600 Miles, when the Day is 16 Hours long?

Answer, 15 Days.

Example 4. If 36 *l.* serve for the Board of 12 Persons 6 Weeks, how long, or how many Weeks will 260 *l.* serve for the Board of 36 Persons? *Answ.* 14 $\frac{2}{3}$ Weeks.

CHAP. XII.

Rules of PRACTICE.

THESE Rules are most compendiously contrived for the speedy casting up of any sort of Goods, or Merchandize; and therefore are of excellent Use among *Merchants*, *Tradesmen*, &c. for their quick and elegant Dispatch of Business; and, from their frequent Use, are called Rules of *Practice*.

Any Question in the *Rule of Three*, that hath a Unit, or 1 for its first Number, may be much sooner done by these brief Rules, than by the Method followed in that, as too much abounding in Figures.

In order for working, the following Tables are to be well understood, and perfectly got by Heart.

The

The Even Parts of Money.

Parts of a Shill. d			*Of a Pound.*
6	is,	$\frac{1}{2}$	or $\frac{1}{40}$
4		$\frac{1}{3}$	$\frac{1}{60}$
3		$\frac{1}{4}$	$\frac{1}{80}$
2		$\frac{1}{6}$	$\frac{1}{120}$
$1\frac{1}{2}$		$\frac{1}{8}$	$\frac{1}{160}$
1		$\frac{1}{12}$	$\frac{1}{240}$
3 Farthings			$\frac{1}{320}$
1 Halfpenny			$\frac{1}{480}$
1 Farthing			$\frac{1}{960}$

s	d		*Parts of a Pound.*
10	0	is	$\frac{1}{2}$
6	8		$\frac{1}{3}$
5	0		$\frac{1}{4}$
4	0		$\frac{1}{5}$
3	4		$\frac{1}{6}$
2	6		$\frac{1}{8}$
2	0		$\frac{1}{10}$
1	8		$\frac{1}{12}$
1	0		$\frac{1}{20}$

The Even Parts of Weight.

Pts. of a Tun. C.		
10	is	$\frac{1}{2}$
5		$\frac{1}{4}$
4		$\frac{1}{5}$
$2\frac{1}{2}$		$\frac{1}{8}$
2		$\frac{1}{10}$
$1\frac{1}{4}$		$\frac{1}{16}$
1		$\frac{1}{20}$

Pts. of C. *Weight.*		
2 *qrs.*	is	$\frac{1}{2}$
1 *qr.*		$\frac{1}{4}$
0 16 lb		$\frac{1}{7}$
0 14		$\frac{1}{8}$
0 8		$\frac{1}{14}$
0 7		$\frac{1}{16}$

Pts. of $\frac{1}{2}$ C. *and* $\frac{1}{4}$ C.			
28	is	$\frac{1}{2}$	$\frac{1}{2}$C
14		$\frac{1}{4}$	
8		$\frac{1}{7}$	
7		$\frac{1}{8}$	
14	is	$\frac{1}{2}$	$\frac{1}{4}$C
7		$\frac{1}{4}$	
4		$\frac{1}{7}$	

I. When the Price of the Integer is a Farthing, take the 4th Part of the given Number (or divide it by 4) and the Quotient is Pence, and if any thing remain, it is Farthings; then them Pence divide by 12 and by 20: Or you may take the 6th part of the given Number, and the Quotient will be three Half-pences, and then divide by 8 and by 20. Or else you may take the 12th part, and the Quotient will be Three-pences. *Examples* of these several Ways follow, *viz.*

4)987654

4)987654 lb. of *Cast Iron*, at $\frac{1}{4}$ per lb.

12)246913——$\frac{2}{4}$ *Rem. because the Dividend was Far-(things.*

2|0)20571|6——1 *d.*

l. 1028-16-1 $\frac{1}{2}$, *Ans.*

Again.

6)987654

$\frac{1}{8}$)164609 Three Half-pen-(ces.

2|0)20571|6——1 *d* $\frac{1}{2}$. *Because the Dividend was Three-(Half Pences.*

l. 1028-16-1 $\frac{1}{2}$ *Answer.*

Once more.

12)987654

Three-pences. $\frac{1}{4}$)82304-1$\frac{1}{2}$

2|0)20571|6

Ans. l. 1028-16-1 $\frac{1}{2}$

I have often observed, that Learners are many times in doubt concerning the several Remainders, what to call or account them; wherefore let them note once for all, That at any Time, whatever remains, it is always of the same Name with that you account the Dividend; that is, if the Dividend is accounted Farthings, or Pence, or Shillings, &c. so is the Remainder to be reckoned. Or, to represent it more intelligibly, the Remainder is always such a Part of a Shilling (if you take Parts of a Shilling) as

as you take for, whether a $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{8}$, or $\frac{1}{12}$; that is, the Remainders are either Six-Pences, Groats, Three-Pences, &c. according to the Part you take. And so likewise for the even Parts of a Pound, you may be governed by the same Rules.

II. When the Price given is $\frac{1}{2}$ *d.* then take the 12th Part of the given Number, and the Quotient will be Six-pences; of which take the Half, and they are Shillings, which divide by 20, by halving them, &c. to bring them into Pounds.

12)5670 ℔ Copperas, at $\frac{1}{2}$ *per* ℔.

6*d* $\frac{1}{2}$| 472—3*d*

2|0)23|6

l. 11-16-3 *Answ.*

Or thus:

℔.

$\frac{1}{2}$)5670 *Sea-Bread* at $\frac{1}{2}$ *d.*

1*d* $\frac{1}{12}$|2835

2|0)23|6—3*d*

l. 11-16-3 *Answ.*

In the second Work I take the $\frac{1}{2}$ of the Half-pence, and they make Pence, of which I take the $\frac{1}{12}$, a Penny being the $\frac{1}{12}$ of a Shilling, &c.

III. When the Price is 3 Farthings, take the $\frac{1}{2}$ of the given Number of Integers, and that half is 3 Half-pennies, or the 8th Part, and they are Six-pences; which either divide by 8, and by 20; or by $\frac{1}{2}$, and by 20, &c.

$\frac{1}{2}$ 4720 Ells Canvas, at $\frac{3}{4}$.

$\frac{1}{8}$ 2360

2|0)29|5

l. 14-15 *Answ.*

Or thus:

$\frac{1}{8}$ 4720 Ells at $\frac{3}{4}$

$\frac{1}{2}$ 590

29|5

l. 14-15 *Answ.*

IV.

IV. When the given Price is *Pence*, and an even part of a Shilling, consider what part it is, and divide the given Quantity by it, and the Quotient is Shillings; and them Shillings by 20, &c.

1*d*	$\frac{1}{12}$	549 lb. *Iron* at 1*d*	3*d*	$\frac{1}{4}$	7654 lb. *Soap* at 3*d*
		4|5 9 *d.*			191|3 6
		l. 2 5 9 *Answer.*			*l.* 95 13 6 *Answ.*
1½ *d*	$\frac{1}{8}$	369 lb. at 1*d* ½.	4*d*	$\frac{1}{3}$	2486 lb. at 4 *d.*
		4|6 1 ½			82|8 8
		l. 2 6 1 ½ *Answ.*			*l.* 41 8 8 *Answer.*
2*d*	$\frac{1}{6}$	396 *Yds.* *Ribbon* (at 2 *d.*	6*d*	$\frac{1}{2}$	5769 at 6 *d.*
		6|6			288|4 6
		l. 3 6 *Answer.*			*l.* 144 4 6 *Answ.*

Sums in *Practice* admit of various Ways of Working, and equally short, each producing the same Answer; and serve as a Proof to each other, and 'tis very proper, and most concise, to prove *Practice* by *Practice.* It likewise may be proved by the *Rule of Three*; or by reducing the Answer into the same Name with the Price, and divide it by the Price, and the Quotient will be the given Quantity: Or if you divide by the Quantity, the Quotient will be the Price.

V. When the Price of the Integer is Pence, and no even part of a Shilling, it may be divided into even parts; as 7 Pence is composed of the parts $\frac{1}{4}$ and $\frac{1}{3}$, *viz.* 3 *d.* and 4 *d.* Wherefore, first take $\frac{1}{4}$ of the given Number, and then the $\frac{1}{3}$ also, and add both Lines together. Likewise 9 *d.* is composed of the Parts $\frac{1}{2}$ and $\frac{1}{4}$, or 6 *d.* and 3 *d.* and 5 *d.* of 3 *d.* and 2 *d.* &c. Sometimes it is more concise

cise to take parts of parts: As suppose 9*d.* were the Price, I first take $\frac{1}{2}$ for 6, and then the $\frac{1}{2}$ of that $\frac{1}{2}$ for the 3*d.* because 3*d.* is the $\frac{1}{2}$ of 6; and then I add the two Lines together. Or, if the Price were 5 Farthings, I take $\frac{1}{12}$ for the Penny, and then the $\frac{1}{4}$ of that Line for the Farthing, because a Farthing is $\frac{1}{4}$ of a Penny.

Example.

		342 lb *Candles*, at 5*d*
3*d*	$\frac{1}{4}$	85 6
2	$\frac{1}{6}$	57 0
		14|2 6
		l. 7 2 6 *Answ.*

		429 lb *Loaf Sugar*, at 9*d*
6*d*	$\frac{1}{2}$	214 6
3	$\frac{1}{2}$ 6*d*	107 3
		32|1 9
		*l.*16 1 9 *Ans.*

		679 *Yds Paving*, at 7*d*
3*d*	$\frac{1}{4}$	169 9 *d*
4*d*	$\frac{1}{3}$	226 4
		39|6 1
		l. 19 16 1 *Answ.*

Or thus:

		429 lb at 9 *d.*
6*d*	$\frac{1}{2}$	214 6
3	$\frac{1}{4}$	107 3
		32|1 9
		*l.*16 1 9 *Answ.*

		3790 *Yds Linnen* at 10*d*
6*d*	$\frac{1}{2}$	1895
4*d*	$\frac{1}{3}$	1263 4
		315|8 4
		*l.*157 18 4 *Answ.*

Or thus:

Yds 37900

12\|315\|8 4

l. 157 18 4

In the last Work I put a Cypher to the given Number, which is multiplying by 10, and the Product is Pence; which I divide by 12 and by 20.

1349

		1349 lb *Tobacco*, at 11*d*
6*d*	$\frac{1}{2}$	674--6*d*
4	$\frac{1}{3}$	449--8
1 of 4*d*	$\frac{1}{4}$	112--5
		123|6--7
		l. 61 : 16 : 7 *Answ.*

Or thus:

13490 lb. at 11 *d*

Odd Penny--1349

12)14839

123|6--7

l. 61 : 16 : 7 *Ans.*

		4796 Quarts of *Beer*, at 5 *qrs.*
1*d*	$\frac{1}{12}$	399-- 8
$\frac{1}{4}$ *of a Penny*	$\frac{1}{4}$	99--11
		49'9-- 7
		Ans. *l.* 24 : 19 : 7

VI. When the *Price* is *Pence* and *Farthings*, then work for the Pence as before; and for the Farthings, observe what part they make, of the parts taken before, which take out of any one of the Lines, of which the Farthing or Farthings make an even part, and add all together.

d		856 *Yds Ribbon* (at 4*d* $\frac{1}{2}$
4	$\frac{1}{3}$	285--4
$\frac{1}{2}$ of 4 *d*	$\frac{1}{8}$	35--8
		32|1 : 0
		l. 16 : 1 : 0 *Ans.*

d		987 *Yds Painting* (at 10$\frac{3}{4}$
6	$\frac{1}{2}$	493--6
4	$\frac{1}{3}$	329
$\frac{1}{2}$	$\frac{1}{8}$	41--1$\frac{1}{2}$
0	4*d*	20--6$\frac{3}{4}$
$\frac{1}{4}$	$\frac{1}{2}$	
		88|4--2$\frac{1}{4}$
		l. 44 : 4 : 2$\frac{1}{4}$ *Ans.*

Here

Here I first take the $\frac{1}{3}$ part of the given Number for the Groat; then for the Half-pence, I consider it is the 8th part of 4*d.* wherefore I take the 8th part of that Line, *viz.* 285 *s.* 4 *d.* saying, the 8's in 28, &c.

		479 lb. *Pepper*, at (9 *d.* $\frac{3}{4}$.
6*d*	$\frac{1}{2}$	239--6
d		119--9
$3\frac{1}{2}$ of 6		29-11$\frac{1}{4}$
$\frac{3}{4}$ of 3 *d.*	$\frac{1}{4}$	38|9--2$\frac{1}{2}$
		l. 19 : 9 : 2$\frac{1}{4}$ *Ans.*

		679 lb. of *Cotton*, at (7*d.* $\frac{1}{2}$
6	$\frac{1}{2}$	339--6
$1\frac{1}{2}$ of 6*d*	$\frac{1}{4}$	84-10$\frac{1}{2}$
		42|4--4$\frac{1}{2}$
		l. 21 : 04 : 4$\frac{1}{2}$ *Ans.*

VII. When the Price is any Number of Pence above a Shilling, and not two Shillings, let the given Quantity stand as Shillings, and take even parts for the Pence, and set the Quotient underneath in proper Order, without drawing a Line, and add it to the given Number, and the Total will be the Answer in Shillings.

Examples.

	469 *Yds* Stuff, at 13 *d.*
1*d* $\frac{1}{12}$	39--1*d.*
	50|8--1
	l. 25 : 8 : 1 Answ.

		742 *Yds.* at 19 *d.*
6*d*	$\frac{1}{2}$	371
1 of 6*d.*	$\frac{1}{6}$	61--10
		117|4--10
		l. 58 : 14 : 10

Here 469 stands as Shillings, of which I take the 12th part of the Penny, and add both together: In the next *Example*, 742 stands as Shillings, of which I take the $\frac{1}{2}$ for the 6*d.* and 6th part of 371, &c.

4*d.*	$\frac{1}{3}$	2460 lb *Tobacco* at	*Or thus:*
		820 (16 *d.*	3)2460
		328|0	5) 820
		164 Anſ.	*l.* 164

		420 Ells *Holland,*	*d*		794 *Buſh.* of *Oats,*	
4*d*	$\frac{1}{3}$	140 (20 *d.* $\frac{1}{2}$	6	$\frac{1}{2}$	397 at 22 *d.* $\frac{1}{2}$	
4*d*	$\frac{1}{3}$	140	4	$\frac{1}{3}$	264--8	
$\frac{1}{2}$ of 4*d*	$\frac{1}{8}$	17--6	$\frac{1}{2}$	$\frac{1}{8}$	33--1	
		71|7--6			148|8--9	
		l. 35 : 17 : 6			*l.* 74 : 8 : 9 *Anſw.*	

Note, That in the ſecond Work of the firſt *Example* above, I divide by 15, according to the 9th Rule of the 5th Chapter; becauſe 16 *d* is the 15th Part of a Pound, as 15 is the 16th Part. Or when the Price is 14, 16, 18, 21, or 22*d*, under 2*s.*; if you bring the ſaid Prices into 2*d*, 3*d*, 4*d* 6*d*, or 8 Pences, you may bring them into Pounds, &c. at one Operation, by taking Parts according to the 2d Table of *Practice*, at the beginning of the Rules of Practice.

Examples.

7890 *Tds.* at 14*d.* 988 lb. at 15 *d.*

7 5

2*d.* $\frac{1}{120}$ \| 55230 *Two pences.* [3*d.* $\frac{1}{80}$ 4940 *Three pences.*

Anſw. l. 460 5 *Anſw. l.* 61-15

6796

6709 lb at 21 *d*
7
$3d$ | $\frac{1}{8}$ | 4696,3 *Three-pences*
l. 587-0-9

3796 at 22 *d*
11
$2d$ | $\frac{1}{120}$ | 4175,6
l. 347-19-4

Answers

VIII. When the Price given is such a Number of *Shillings*, or *Shillings* and *Pence*, as make an even Part of a *Pound*, divide the given Quantity by that Part, and the Quotient will be *Pounds*.

Examples.

1*s* 8*d* | $\frac{1}{12}$ | 374 *Guild.* at 20*d*
Ans. l. 31-3-4

746 *Gal. Spirits*, at 2*s*
2*s* | $\frac{1}{10}$ | *l.* 74-12 *Answ.*

In the first of these *Example*, I divide the given Quantity by 12, because 20 *d* is $\frac{1}{12}$ of a *Pound*, and there remains 2, which is two 1*s*. 8*d*'s or 3*s* 4*d*. So the *Answer* is *l.* 31-3-4.

IX. When, at any time, the *Price* is 2*s*. as in the second *Example* above, the Answer may be known at Sight; for its but doubling the last Figure towards the Right Hand, and note it for Shillings; and the other Figures towards the Left Hand are Pounds, as above, the double of 6 is 12 *s* and the 2 other Figures are Pounds, *viz.* 74 *l.* in all *l.* 74-12.

From this Notion of understanding the Value of any Quantity, at 2 *s* at Sight, many Things may be very expeditiously answered, *viz.*

Richard Pearson

Examples.

756 *Gal.* at 3*s* 6*d per Gal.*

75-12 at 2 *s.*
$\frac{1}{2}$ 37-16 at 1
$\frac{1}{2}$ 18-18 at 6*d*

l. 132-6 Answ.

492 *Yds* at 9*s* 4*d*

49-4 at 2*s.*
4 times 2 is 8*s*

196 16 at 8*s*
24 12 at 1
4*d* $\frac{1}{3}$ 8-04 at 4*d.*

l. 229-12 *Answ.*

3*s* 4*d* | $\frac{1}{6}$ | 576 lb *Indigo*, at (3*s* 4*d*

l. 96 *Answ.*

4*s* | $\frac{1}{5}$ | 749 *pcs.* $\frac{5}{8}$ at 4*s*

l. 149-16 *Answ.*

5*s* | $\frac{1}{4}$ | 296 *Yds* *Silk* at 5*s*

l. 74 *Answ.*

6*s* 8*d* | $\frac{1}{3}$ | 988 *Gal. Brandy* (at 6*s* 8*d*

l. 329-6-8 *Answ.*

2*s* 6*d.* | $\frac{1}{8}$ | 973 *Florins* at (2 *s* 6*d.*

l. 121-12-6 *Answ.*

Here 5 *Half Crowns remain, or* 12*s* 6*d.*

10*s* | $\frac{1}{2}$ | 575 *Yds* Br. Cloth (at 10 *s*

l. 287-10 *Answ.*

X. When the Price is Shillings and Pence, or Shillings, Pence, and Farthings, and no even Part of a Pound, then multiply the given Quantity by the Shillings in the price, and take parts for the rest, and add all together.

Examples.

```
        756 lb. Coffee at 5s 8d        436 lb Cinnamon, at
          5                              9          (9s 7d
        ----                           ----
 d |  |  3780                   d |   |  3924
 4 |1/3|  252                   6 |1/2|   218
 4 |1/3|  252                   1 |1/6|    36-4
        ----                           ------
        42814                          41718-4
        -----                          -------
     l. 214-4 Ans.                  l. 208-18-4 Ans.

        570 Qrs. of Wheat              746 C. Cheese,
         32     (at 32s 6d              27 (at 27s 4d
        ----                           ----
   |    |  1140                    |   |  5222
 d |    |  1710                  d |   |  1492
 6 |1/2 |   285                  4 |1/3|   248-8
        -----                          -------
        185215                         2039 10-8
        ------                         ---------
     l. 926-5 Ans.                  l. 1019-10-8 Ans.
```

XI. When the Price is Shillings and Pence, and no even part of a Pound, yet many times it may be divided into even parts; as 7s 6s is composed of 5s and 2s 6d, and 11s 8d of 10s and 1s 8d; 12s 6d of 10s and 2s 6d; 15s of 10s and 5 s. &c.

```
                                              Or thus:
        205 Gal. Tent at 7s 6d                  205
        ----                                  -------
 5s    |1/4|  51-5              2s 6d 1/8   25-12-6
 2s 6d |1/8|  25-12-6     [3 1/2 Cr. is 7s 6d     3
        ---------                             -------
     l. 76-17-6                            l. 76-17-6
                                              -------
                                              1290 Bar.
```

190 Bar. *Orgal*, at (11s 8d

10s	$\frac{1}{2}$	95
1s 8d	$\frac{1}{12}$	15-16 8
		l 110-16.8

172 C. *Iron*, at 12s (6d

10s	$\frac{1}{2}$	86
2s 6d	$\frac{1}{4}$	21-10
		l 107-10 Ans.

XII. When at any time the Price is an even Number of Shillings, multiply the Quantity by half of the Price, and double the first Figure of the Product, and set it apart for Shillings; and the other Figures to the Left Hand will be Pounds.

Examples.

79 Bush. *Wheat*, at 6s
3 — the half 3
l 23.14 Answer

90 lb. *Sarsafrass*, at 8s
4 — 4
l. 36-00 Answer.

764 C. *Suff.* Cheese, at 12s
6 — the half 6
l 458-8 Ans.

85 *Yards* of Cloth, at 14s
7 — 7
l 59-10 Ans.

326 lb. *Mace*, at 22s
11 — 11
l 358-12 Answer.

623 C. *Ginger*, at 24s
12 — 12
l 747-12 Ans.

When the Multiplier consists of two Places (when the Price is an even Number of Shillings) and that it cannot well be work'd to have the Product in one Line; after you have done with the Unit Figure, and come to multiply by the second, observe to set the first Figure of the Product just under the second of the first Line; for that doubled, and set apart for Shillings, takes up the first Place.

756 C of *Currants*, at 48 *s*	219 C at 56 *s*
24	28
302-8	175-4
1512	438
l 1814-8 *Facit.*	Anſ. *l* 613-4

When the Price is an even Number of Shillings, if it be required to know what Quantity of any thing may be bought for ſo much Money, it may be known by this ſhort Rule, *viz.* annex a Cypher to the Money, and divide by half of the propoſed Price.

Examples.

How many Pounds of *Indigo* may be bought for 54 *l* at 4 *s per* lb.

2)540

Anſ. 270 lb.

What Quantity of Cloth at 12 *s. per* Yd may be bought for 236 *l*?

6)2360

Yards 393 $\frac{2}{6}$ or $\frac{1}{3}$ Anſ.

How many Gallons of *Canary* at 6 *s per* Gallon, may be bought for 250 *l*?

3)2500

833 $\frac{1}{3}$ Anſ.

XIII. When

XIII. When the Price is an odd Number of Shillings, work for the even Part, as in the last Rule; and for the odd Shilling take the $\frac{1}{20}$ of the given Number, and add them together, as in the following Examples.

96 *Pistoles*, at 17 *s*		260 lb. *China Silk*, at 21 *s*	
8	8-1	10	10-1
s 76-16		260-00	
1 $\frac{1}{20}$ 4-16		1 *s* $\frac{1}{20}$ 13-20	
l 81-12 Answer.		*l* 273 00 Ans.	

XIV. When the Price of the Integer is Pounds, Shilling, Pence, reduce the Pounds and Shillings into Shillings, and multiply the given Number of Integers by the said Shillings: and then take Parts for the Pence, as before. Or if the Shillings and Pence make an even part, or even parts of a Pound, then multiply the Quantity by the Pounds, and take even parts of a Pound for the Remainder of the Price, and add the Results together. Or when the Price is Shillings above 20, and under 60, you may let the Integers stand as Pounds, and (without drawing a Line) take parts for the odd Money, and add all together, &c.

Examples.

Or thus:

	C	l s d		C	l s d
	426 *Turmerick* at 3-12-6			426 at 3-12-6	
	72	20		3	
6	852	72		1278	
	2982	10 *s*	$\frac{1}{2}$	213	
$\frac{1}{2}$	213	2 *s* 6 *d*	$\frac{1}{8}$	53-5	
	3088|5			*l* 1544-5 Ans.	
	l 1544-5 Ans.				

```
            C          l  s  d          Or thus :
       316 Saltpet. at 4-15-6           C      l  s  d
        95            20              316 at 4-15-6
       ----           --                4
       1580           95              ----
d      2844           -- 10s.         1264
6 | 1/2  158           5          | 1/2 | 158
       -----                      | 1/2 | 79
      3017|8                  6d  | 1/10|  7-18
       -----                          -----
  l. 1508-18 Ans.                   l. 1508 Ans.
       -----
```

XV. If the Quantity given hath any odd Weight or Measure annexed to it, as $\frac{1}{4}$, a $\frac{1}{2}$, or $\frac{3}{4}$, (after you have work'd as before, for the whole Number) then take $\frac{1}{4}$, a $\frac{1}{2}$, or $\frac{3}{4}$ of the Price, and add it to the other Work,

Examples.

```
        lb.                              lb.
        256 1/2 Legee Silk, at           326 3/4 Saffron at 54s-8d
        15        (15s 7d                 54      qr.   --------
        ----      ------------           ----    1/2 | 1/2 | 27-8
        1280      1/2 7--9 1/2           1304    1/4 | 1/2 | 13-4
d       256                             1630               -----
6 | 1/4 | 128                            163                41 0
1 | 1/12| 21-4                           54-4               -----
for 1/2 lb  7-9 1/2                      41-0 for the 3/4.
        -----                           -----
1/2 | 399|7-1 1/2                       1786|2-4
        -----                           -----
  l. 199-17-1 1/2 Ans.                l. 893-2-4
        -----                           -----
```

When you take for 3 *qrs.* of any thing, first take $\frac{1}{2}$ of the given Price, and then the $\frac{1}{2}$ of that $\frac{1}{2}$, and add them together as above. Or you may take the $\frac{1}{2}$ and $\frac{1}{4}$ Parts, and add them together; but the other is easier and quickest.

C.
246 $\frac{3}{4}$ *Fustick*, at (11s 6d

d 246
6 $\frac{1}{2}$ 123.

$\frac{3}{4}$ 2-10 $\frac{1}{2}$

2829
2-10 $\frac{1}{2}$

$\frac{1}{20}$|2831|1-10 $\frac{1}{2}$

l. 141-11-10 $\frac{1}{2}$ Ans.

Ells. *s.* *d.*
216 $\frac{2}{5}$ *Lawns* at 12 9
12

$\frac{2}{5}$ 2-6 $\frac{1}{2}$

d 2592
6|$\frac{1}{2}$| 108
3|$\frac{1}{4}$| 54
2-6 $\frac{1}{2}$, $\frac{2}{5}$

275|6-6 $\frac{1}{2}$, $\frac{2}{5}$

l. 137-16 6 $\frac{1}{2}$, $\frac{2}{5}$ Ans.

C. lb.
134 $\frac{1}{2}$ 14 *Raisins*, at 31-6 *per Cent.*
31

C.
$\frac{1}{2}$ $\frac{1}{2}$ 15-9
14 lb. $\frac{1}{4}$ 3-11 $\frac{1}{4}$

134
402
19 8 $\frac{3}{4}$ for $\frac{1}{2}$ C. 14 lb. 19-08 $\frac{3}{4}$

4171|3-8 $\frac{3}{4}$

l. 208-13-8 $\frac{3}{4}$ Ans.

Here the even Parts of Weight must be observed, as they are set down in the beginning of this Chapter: As for the $\frac{1}{2}$ *C.* you take half of the *Price*, and for 14 lb. you take $\frac{1}{4}$ of 15*s* 9*d*. as it being $\frac{1}{4}$ of $\frac{1}{2}$ a C. &c.

Sums of this Kind, and many others, may as practically be done by *Multiplication* only, (except taking the Parts) as it is taught in the first Chapter of this Book.

Examples.

		C.	s.	d.
75 ½ *Nicorago* Wood, at			22	6
				8
	l.	9	00	0
				9
		81	00	0
		3	07	6
		0	11	3
	l.	84	18	9

Here I multiply, first by 8, and then by 9; 8 times 9 making 72; and for the 3 odd Hundreds wanting, I multiply the Price by 3, and then I take half of the Price for the ½ C. and add them together; as by the Work may be seen.

C.			s.	d.
63 ¾ *Allom*, at			12	10 *per C.*
				7
Here I multiply by 7, and by 9; 7 times 9 making 63 the Quantity.		4	09	10
				9
	l.	40	08	6
			6	5
			3	2 ½
	l.	40	18	1 ½

		Hhds		*Or thus:*	*l*	*s*
		156 Wine at ——			12	13 *per Hhd.*
		42				10
s		1872			126	10
10	$\frac{1}{2}$	78				10
2	$\frac{1}{5}$	15	12		1265	00
1	$\frac{1}{2}$	7	16		632	10
		l 1973	08		75	18
					l 1973	08 Answer.

		96 *Fodder* of *Lead*, at ——	*l* 8-13-4
		8	12
		768	104 00 0
13-4	$\frac{2}{3}$	32	8
		32	*l* 832 00 0
		l 832 Answer.	

As for short Methods of casting up Bills of Parcels, &c. 'tis best to do them by *Multiplication*, as is directed in that Rule.

Here follow some Questions, with their Answers, for the Learner's Eexercise.

75 C $\frac{1}{2}$ 19 lb. at 4 *d* $\frac{1}{2}$ *per* Pound.
Answer *l* 158-18-1$\frac{1}{2}$

71081 lb. at 35*s* 6*d* *per* C. Ans. *l* 1126-10-1

67108 *oz.* at 16 *d* $\frac{1}{4}$ *per* lb. Ans. *l* 283-19-8$\frac{1}{2}$

71 lb. 19 *oz.* 15 *dwt.* at 5*s* 9*d* *per* Ounce.
Answer, *l* 248-0-9$\frac{3}{4}$

319 Yds at 5*s* 6 *d* *per* Ell. Ans. *l* 70-3-7$\frac{1}{5}$

419 $\frac{7}{8}$ Yds at 4*s* 10*d* $\frac{1}{8}$. Ans. *l* 101-14-1 $\frac{2}{4}$, $\frac{3}{8}$

47 Quarters, at 4*s* 9*d* *per Bush.* Ans. *l* 89-06.

715 $\frac{1}{4}$ Yds at 4*s* 10*d* $\frac{1}{8}$. Ans. *l* 173-4-5$\frac{7}{8}$

59 *Ounces*, 11 *dwt.* 18 *gr.* at 5 *s.* 7 *d. per Ounce.*
Anf. *l.* 16-12-8

50 lb. ¾ of Silk, at 20 *d. per Oz.* Anf. *l.* 67-13-4

66 *Grofs*, at 3 *s.* 9 *d. per Doz.* Anf. *l.* 148-10

56 Load of *Hay*, at 18 *d per Trufs.* Anf. *l.* 151-4

Sold 3 Sacks of *Rice*, Contents, *viz.*

	C.	*qrs.*	lb.		
N° 1	4	1	10	*Tare* 7	*Clough* 2 lb. *per* Sack, *Tret*
2	3	2	19	8	4 lb. *per* 104 lb. at 10 *d* ½
3	4	0	20	7	*per* lb. Neat.

What comes the 3 Sacks to? Anf. *l.* 56-4-11

For the deducting of *Tare*, *Tret*, &c. the Learner muft have recourfe to the VIIth Chapter of this Book.

Sugar, 95 *C.* 1 *qr.* 19 lb. *Grofs*, *Tare* 12 *C.* 3 *qrs.* 10 lb. at 47 *s.* 6 *d. per C. Nt.* what comes the Sugar to at that Rate? Anf. *l.* 196-2-6 ½

Other TABLES *of the even Parts of a* Shilling, *and of a* Pound.

Parts of a Shilling.

10 *d*	is	5/6
9	is	3/4
8	is	2/3
7 ½	is	5/8
4 ½	is	3/8

Parts of a Pound.

18 *s*	is	9/10
17-6 *d*	is	7/8
16-8	is	5/6
15	is	3/4
14	is	7/10
13-4	is	2/3
12-6	is	5/8
8	is	4/10
7-6	is	3/8
6	is	3/10

If the Price of the Integer be at any of the Rates in either of thefe Tables, multiply the given Quantity by the Numerator, and divide by the Denominator, and the Quotient will be the Anfwer.

Examples,

Examples.

d
10 | $\frac{5}{6}$ | 456 ℔ *Loaf Sug.* (at 10 d
5
6)2280
38|0
l. 19 Ans.

746 *Yds paving* at 4 *d* $\frac{1}{2}$
3
4*d* $\frac{1}{2}$ | $\frac{3}{8}$ | 2238
27|9 9*d*
l. 13-19-9 Ans.

Foot.
765 *Glazing* at 9*d*
9*d* | $\frac{3}{4}$ | 3
4)2295
57|3-9
l. 28-13-4 *Answ.*

℔
671 *Joppa* Soap at 7 *d.* $\frac{1}{2}$
5
7*d* $\frac{1}{2}$ | $\frac{5}{8}$ | 3355-4 $\frac{1}{2}$
41|9
l. 20-19-4 $\frac{1}{2}$ Ans.

C.
695 *Shomask* at (18 *s*
9*s* | $\frac{9}{10}$ | 9
1|0)625|5
l. 625|-10 *Answ.*

℔
694 *Belladine* Silk at (17*s* 6*d*
7
17*s* 6*d* | $\frac{7}{8}$ | 4858
l. 607-5 *Facit.*

950 Pr. *Hose* at 6 *s*
6*s* | $\frac{3}{10}$ | 3
285|0
l. 285 *Answers*

842 ℔ *Rhub.* at 13*s* 4*d*
13*s* 4*d* | $\frac{2}{3}$ | 2
1684
l. 561-6-8

Other

Other Examples of Practice promiscuously set, and most expeditiously wrought.

Gal. d — 1536 at 15 p. Gal.
d 15 is $\frac{1}{16}$ of a l.
4 | 1536
4 | 384
l. 96 Facit.

℔ d. — 7490 at 16 p. ℔
d 16 is $\frac{1}{15}$ of a l.
5 | 7490
3 | 1498
l. 499 $\frac{1}{3}$ Facit.

8d $\frac{1}{30}$ of a l. | 76934 ℔ Tobacco at (8d. p. ℔
l. 256-9-4 Facit.

756 Gall. at 5s 8d.
5s $\frac{1}{4}$ 189
8d $\frac{1}{30}$ 25-4
l. 214-4 Answ.

5s $\frac{1}{4}$, 2s 6d $\frac{1}{8}$ of a l. | 205 Yds. at 7s 6d
51-5
25-12-6
Facit, l. 76-17-6

170 ℔ Raw Silk at (16s 8d.
10s $\frac{1}{2}$ 85.
6s 8d. $\frac{1}{3}$ 56-13-4
l. 141-13-4 Facit.

40 s { 125 Pcs. at l. 2-5-6 p. pce.
125
5s $\frac{1}{4}$ 31-5
6d $\frac{1}{10}$ of 5s 3-2-6
l. 284-7-6 Facit.

215 C. of Hops, at 3 l. (17s 6d.
860
Subt. $\frac{1}{8}$ 26-17-6
l. 833-02-6

s d 2 6 $\frac{1}{8}$ the $\frac{1}{2}$C. — 75 C. $\frac{1}{2}$ Logwood at (22 s 6d
9-07-6
11-3
l. 84-18-9 Answ.

	Days		
	365 at 5*d per Day*		
6*d* $\frac{1}{40}$	9 02	6	
Subt. $\frac{1}{12}$	1 10	5	
	l. 7 12	1	Answ.

C.	*qrs.*	lb.		
12	3	14	*Long Pepper,*	
			at *l.* 3 10 6	
			12	
			42 06 0	
$\frac{1}{2}$ *C.* the $\frac{1}{2}$			1 15 3	
$\frac{1}{4}$ a $\frac{1}{2}$ of the $\frac{1}{2}$ *C.*			17 7 $\frac{1}{2}$	
14 lb the $\frac{1}{2}$ of $\frac{1}{4}$ *C.*			8 9 $\frac{3}{4}$	
			Facit, l. 45 07 8 $\frac{1}{4}$	

	26812 lb at 19*d*		
20*d* $\frac{1}{12}$	2234	06	8
Subt. $\frac{1}{20}$	111	14	4
	L. 2122	12	4

	lb.		
	6709 at 21 *d*		
2*s* $\frac{1}{10}$	670	18	
Subt. $\frac{1}{80}$	83	17	3
for 3*d* over			
	l. 587	00	9 Ans.

	3796 *Yards* at 22 *d*		
20*d* $\frac{1}{12}$	316	06	8
2*d* $\frac{1}{120}$	31	12	8
	l. 347	19	4

	75 C. at 20*s* 8*d*.		
4*d* $\frac{1}{60}$	1	5	
4*d* $\frac{1}{60}$	1	5	
	l. 77	10	Answ.

When it happens that the Price of the Integer is a known part of a pound, as 17*s* 6*d* is $\frac{7}{8}$, 13*s* 4*d* is $\frac{2}{3}$ 16*s* 8*d* is $\frac{5}{6}$, and 7*s* 6*d* $\frac{3}{8}$, *&c.* then multiply the given Number by the *Numerator*, and divide the product by the *Denominator* : Or divide by the *Denominator*, and multiply by the *Numerator*. See the following Work.

Example

Examples.

420 *Tb.* at 7 *s* 6 *d*
3
8)1260
l. 157-10 *Facit.*

Or thus:
8)420
52 10
3
Answer 157 10

479 *Ells*, at 7 *s* 6 *d*
7
8) 3353
l. 419 $\frac{1}{8}$, or 2 *s* 6*d* Ans.

Or thus:
Subtract $\frac{1}{8}$ from the given Numb. *L.* 59 17 6
7
Facit l. 419 02 6

697 *Gall.* at 16 *s* 8*d*
5
6)3485
l. 580 $\frac{5}{6}$ or *s* 16-8 Ans.

Or thus:
Subtract $\frac{1}{6}$ from the given Numb. *l.* 116 03 4
5
Facit l. 580 16 8

CHAP XIII.

COMPANY.

THIS Rule teaches (by knowing the Parts of which a Joint Stock is composed, with a supposed *Gain* or *Loss*, resulting therefrom by Trade) to estimate or determine each Person's particular Share of the Gain or Loss, in proportion to his principal in the Joint Stock.

By

By this *Rule* may also a Bankrupt's Estate be divided among his Creditors. Likewise Legacies, &c. adjusted, in Case of a Deficiency of Assets, or Effects; and many other Things.

I. Questions in this Rule are worked by the *Rule of Three*; there being to be as many several Statings, as there are Members in the Joint-Stock, if none of their Stocks be alike.

II. The total Sum of the several Stocks is to be the first Number in the *Rule of Three*; the *Gain*, or *Loss*, the second, and each Man's particular Stock the third.

Example 1.

A and B enter into Partnership; A puts into Stock 230*l.* and B 320*l.* and after 12 Months Trade, they have gained 165*l.* how much must each Person have of the Gain, in proportion to his Money in Company?

230*l.* A
320 B

If 550 gain 165, what 230*l.* A's Stock?
230

4950
330

55|0)3795|0(69 *lb.* A's Share.
330

495
495

---

(0)

Again,

Again, If 550 *l* gain 165 *l* what 330 *l* B's Stock?

```
              320
            ------
             3300
             495
            -------
    55|0)5280|0( 96 l B's Share.
         495      69   A's Share.
         ----    ----
          330    165 Proof.
          330    ----
         ----
          (0)
```

Here I add their several Stocks together, and they make 550 *l*. which is the first Number in the *Rule of Three*; the *Gain*, *viz*. 165 *l* the second; and 230 *l* the Stock of A, the third Number, which makes the first Stating, which being work'd according to Rule, the Answer gives A 69 *l* for his Share. Then 'tis again repeated, and then the Stock of B 320 *l* is the third Number; and after working the second Stating, there arises 96 *l* for the Share of B in the *Gain*, which two Shares being added together, make the total *Gain*, *viz*. 165 *l*. and is a sure Proof the Work is right; and that each Person had his just proportion of the Profit.

Example 2.

Three Persons, A, B, and C, join in Company; A's Money in Stock is 750 *l* B's 460 *l* and C's 500 *l* and after a certain Time, when they settle their Accounts, find their neat Profit 684 *l*. What must each have of the *Gain*?

```
     750 l.
     460
     500
     500
    -----
If  1710 l gain 684 l what 750 l      Ans. l 300 A
If  1710   gain 684   what 460             184 B
If  1710   gain 684   what 500             200 C
                                          -----
                                    Proof, l 684
```

Example

Example 3.

Admit four Persons make a joint Adventure to Sea, *A* sends 60 *l.* in Tobacco, *B* 80 *l.* in Cloth, *C* 120 *l.* in Leather, and *D* 140*l* in Silk Hose; and after they have dispo-sed of their Returns, their neat Profit amounts but to 72 *l.* what is each Man's Share of the said 72 *l*?

				l.	*s.*
If 400 *l* gain 72 *l* what 60 *l*?			*Answ.*	*A* 10	16
If 400 gain 72 what 80?				*B* 14	08
If 400 gain 72 what 120?				*C* 21	12
If 400 gain 72 what 140?				*D* 25	04
			Proof,	*l.* 72	00

The common Way of having so many Statings and Workings, as there are Partners in the Concern, being intollerably tedious, I have here set down a much more compendious Method of working Sums belonging to this Rule; and though it is derived from *Decimals*, yet it will well enough answer our End by a *Vulgar Operation*, which is this; Annex a Cypher, or Cyphers, to the middle Number; (except it be big enough to divide without, which very rarely is) and then divide it by the first Number, or total Sum of the Stocks; and then, by that Quotient, multiply each Persons particular Stock; and the products will be each Man's proportional Share in the *Gain*, or *Loss*. But you must observe, that when you have multiplied each person's particular Stock by the Quotient aforesaid, you must point, or strike off to the Right Hand, so many Figures or Cyphers, as you annex Cyphers to the Sum to be divided.

Or *Examples* in this Rule may be shorten'd by finding the proportional *Gain* or *Loss*, of one pound; thus: Bring the *Gain* or *Loss* into pence, and divide those pence by the Total of the Stocks, and the Quotient shews what it is *per* pound; and then the Answers may be found by the Rules of *Practice*, *&c.*

Ex-

Example *by the said propos'd Method.*

For a Specimen, let us take the first *Example* in this Rule, where the Sum of the Stocks was 550 *l.* and the total Gain 165 *l* Here I cannot divide 165 by 550; wherefore I join a Cypher to 165, thus, 1650; and then divide it by 550, and the Quotient is 3; by which I multiply 230 *l.* the Stock of A, and it produces 690; and the Cypher on the Right Hand being pointed off, for the Cypher annexed to the Dividend, there is left 69 *l.* for A's Share in the Gain. Then I multiply B's Stock, 320 *l.* by the said Quotient 3, and the Product is 960; then cutting off the Cypher, there remains 96 *l.* for B's Share, &c. which are the same Answers as by the other Way.

The 2d *Example* work'd by this shorter Way.

A 750 }
B 460 } The Gain is 684 *l.*
C 500 }

1710) 6840 (4 the common Multiplier.
6840

(0)

750 A's Stock.
4

l. 300|0 A's Share of the Gain. ——— *l.* 300

460 B's Stock.
4

l. 184|0 B's Share of the Gain ——— *l.* 184

500 C's Stock.
4

l. 200|0 C's Share of the Gain ——— *l.* 200

Proof, *l.* 684

The

The third *Example* by the ſhorter Method ſtands thus:

l. Parts			*l.*			*s.*
10	8	*i.e.*	10	Eight Tenths of a *l*	or	16
14	4		14	Four Tenths of a *l*		8
21	6		21	Six Tenths of a *l*		12
25	2		25	Two Tenths of a *l*		4
Facit, *l* 72	0		72			00

Example 4.

Divide *l* 5760·10 among ſeveral Perſons, ſo that A may have $\frac{1}{2}$, B $\frac{1}{3}$; C $\frac{1}{4}$, D $\frac{1}{6}$, and E $\frac{1}{8}$, and tell me each Man's Part.

In this, and ſuch like Caſes, take a Number out of which ſuch parts may be taken; and take the like parts of that Number, to find the Numbers you ſeek, *viz.* each Man's juſt Proportion, &c. *See the following Works and Anſwers.*

20 *s* Then ſay, If 27 *s* 6 *d*—5760*l* 10*s* what 10*s* &c.

$\frac{1}{2}$	10	0	*Remainders*		2094	14	06	A
$\frac{1}{3}$	6	8	18		1396	09	08	B
$\frac{1}{4}$	5	0	12		1047	07	03	C
$\frac{1}{6}$	3	4	9		698	04	10	D
$\frac{1}{8}$	2	6	6		523	13	07	E
			21				2	
	27	6						
	12		33|0)66|0(2*d*	*Prin.*	5760	10	00	
	330							

Example 5.

In like Manner may be done that Queſtion ſo often critically propoſed, *viz.* of dividing 20 *s* into $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, and $\frac{1}{6}$ parts. *See the following Work.*

$\frac{1}{3}$
4

12 If 342 *d* pay 20 *s* what 120 *d* &c.
5

60
6 If 342 pay 20, what 90, &c.

Common 360 Denominator.

			s	*d*	*Parts.*
$\frac{1}{3}$	of	120	7	0 —	72
$\frac{1}{4}$	360	90	5	3 —	54
$\frac{1}{5}$		72	4	2 —	180
$\frac{1}{6}$		60	3	6 —	36

1st Numb. 342 20 0 — 342 makes 1 to carry, because
in Rule of 3 ———————— (equal to the Divisor 342.

Example 6.

Suppose a *Bankrupt's* Money and Effects amounts to 811 *l* 10 *s* and he owes to several Persons as follows, *viz.*

	l		
To Mr. *Cruel* ————	220	16	6
Mr. *Gripe* ————	312	00	0
Mr. *Hard* ————	117	12	6
Mr. *Covet* ————	106	12	6
Mr. *Near* ————	200	06	0
Mr. *Squeeze* ———	124	12	6
	l 1082	00	0

How much must each Person have of the abovementioned 811 *l* 10 *s* in proportion to his Debt?

	l	*l*	*s*		*l*	*s*	*d*
If	1082 ——	811	10,	what	220	16	6?

Answer, *l* 165 12 4 $\frac{5}{?}$.

Or

Or nearer, by seeing first what it comes to in the Pound, (as mentioned in page 235) and then work each particular Sum by *Practice*. Thus, Bring 811 *l* 10 *s* into Pence, and then divide them Pence by 1082, the Pounds that is owing, and the Quotient shews what it is in the Pound, *viz.* 15 Shillings. Then proceed for further Solution, thus:

What comes *l* 220 16 6 to, at 15 *s per* Pound?

		l 220	16	6 at 15 *s per l*
s				
10	$\frac{1}{2}$	110		
5	$\frac{1}{2}$	55		
			12	$4\frac{1}{2}$ for the 16 *s* 6 *d*
Anſ.		*l* 165	12	$4\frac{1}{2}$

And so of the rest, see the following Answer. Or shorter, by taking $\frac{3}{4}$ of each Person's Debt, because 15 *s* is $\frac{3}{4}$ of a Pound.

	l.	*s*	*d*
Mr. *Cruel* must have *l.*	165	12	$4\frac{1}{2}$
M. *Gripe*————	234	00	0
Mr. *Hard*————	88	04	$4\frac{1}{2}$
Mr. *Covet* ————	79	19	$4\frac{1}{2}$
Mr. *Near* ————	150	04	6
Mr. *Squeeze*————	93	09	$4\frac{1}{2}$
Proof, *l.*	811	10	0

With Time.

When this Rule hath any Relation to a particular Time, then you must multiply each Man's particular Stock of Money by the respective Time it continues in the Joint-Stock, and add all the Products together; which Total must be the first Number in the *Rule of Three*; the Gain or Loss the second, and each Man's Stock multiplied by his

his Time, the third; and then work as before, and as often repeat as there are Partners, &c.

Example 1.

A and B enter into *Company*, A puts into Stock 120 *l* for 7 Months; and B puts 230 *l.* for 10 Months; and in Trading they gain 100 *l* what is each Man's Share, in proportion to his Stock and Time. See the Work following.

120 *l* A's Stock.	230 B's Stock.
7 Months A's Time.	10 Months, B's Time.
840 A's Stock and Time.	2300 B's Stock and Time
2300	

If 3140—gain 100*l* what 840, A's Stock and Time.
Again,
If 3140 gain 100 *l* what 2330, B's Stock and Time.

					Parts	
Answer,	*l* 26	15	00	$\frac{1}{4}$	1660	A
	73	04	11	$\frac{1}{2}$	1480	B

Proof *L.* 100 ———————— 3140 4 *Far.*

Or the Answers may be known by finding a common Multiplier, as directed in *Page* 235; or by finding the proportional part of the Gain due to one Pound, as mentioned in the same page.

Example 2.

Three Persons enter into *Partnership*, *viz.* A, B and C; A puts into Stock 65*l* for 8 Months, B 78 for 12 Months, and C 84 *l* for 6 Months, and they gain 166 *l* 12 *s* what is each Man's Share, &c.?

A's Stock multiplied by 8 produces	520
B's Stock multiplied by 12 gives	936
C's Stock multiplied by 6 produces	504
	1960 St.&Ti.

Then

Then say,

	S. and *T.*	*l.* *s.*	*l.*	*S.* and *T.*
If	1960 gain	160 12	(or 166,6) what	520?

Answ. 44 *l.* 4 *s.* (or 44,2) &c.

CHAP. XIV.

BARTER.

BARTER, or TRUCK, is no more than exchanging one Commodity for another, and so to proportion their Rates, as that neither of the Parties may sustain Loss.

Example 1.

Suppose A has 144 Ells Linnen Cloth, worth 15 *d. per* Ell, which he would *truck* with B for Butter, at 18*s* 9*d* *per* 100 lb. how many Pounds of Butter must B give A for the Linnen?

Ans. 960 Pounds.

The concisest Way to answer Questions in this Rule, is first to find the Value of the first Goods mentioned, by the shortest Way of Practice; and then to answer it by the *Rule of Three.*

15 *d.* is $\frac{1}{16}$ of a *l.* { 4)144 Ells, at 15 *d.*

4) 36

l. 9 or 180 *s.*

Then say,

If 18 *s.* $\frac{3}{4}$ give 100 lb. what 180 *s.* &c.

Answ. 960 *l.*

To

To prove the Work, cast up the 960 lb at 2*d* $\frac{1}{4}$ *per* lb. (for so much it is *per* lb. at 18 *s.* 9 *d.* *per* 100 lb.) and if it amounts to 9 *l.* the Value of the Linnen, the Work is right. Thus:

2*d* $\frac{1}{120}$ of a *l*	96,0 at 2*d* $\frac{1}{4}$ *per* lb.
	8
$\frac{1}{4}$ is $\frac{1}{8}$ of 2*d*.	1
	l. 9 *Facit*,

Example 2.

A has Broad Cloths at 10 *l.* 10 *s. per* Piece, and *B* hath Mace, at 12 *s. per* lb. how many pounds of Mace must *B* give *A* for 24 Broad Cloths? *Answ.* 420 pounds.

24,0
12

If 2 *s* —— 1 lb. what 15,2 lb. &c.

Example 3.

A hath 14 C. Weight of *Sugar*, at 6*d* per lb. for which *B* gave him 1 C. $\frac{3}{4}$ of Cinnamon, what was the Cinnamon rated at *per* lb.

14
14
14
14

112 6*d* $\frac{1}{40}$ of *l.* 15,6,8
84

If 196 Cost *l.* 39,4 what 1 lb. *Ans.* 4 *s.*

Example

Example 4.

A and *B* barter, *A* hath 86 Gallons of *Brandy*, worth 9*s* 2*d per* Gallon ready Money, but in Barter he will have 11*s per* Gallon; *B* hath *Serge* worth 2 *s* 1*d per* Yard, ready Money, *Quere*, How many Yards of *Serge* must *B* give *A* for his 86 Gallons of *Brandy* ?

The Rule. First find what Advance *B* ought to make *per* Yard for his *Serge*, in Proportion to what *A* hath done upon a Gallon of his *Brandy*. Thus :

If 9*s* 2*d* increase to 11*s*, what must 2*s* 1*d* increase to ?
Answ. 2*s* 6*d*.

Then see by Practice what *A*'s *Brandy* comes to at 11*s per* Gallon, which will be found to amount to 47 *l*. 6*s*, then say by the *Rule of Three*,

	s	*d*		*Yard*		*l*	*s*	
If	2	6	buy	1	what will	47	6	buy ?

Answ. 378 Yards $\frac{2}{5}$.

And so of any other *Example* in this Rule of this Kind.

CHAP. XV.

INTEREST

IS an Allowance of the *Borrower* to the *Lender*, in Consideration of the Use made of the *Lendor*'s Money ; and therefore Interest sometimes is called *Use Money*, and this *Interest* is either *Simple* or *Compound*. *Simple Interest* is that which cometh of the *Principal* only ; and *Compound Interest* is that which ariseth from *Principal* and *Interest* also, and

is therefore called *Interest upon Interest*; but, this latter being accounted very unlawful, is seldom allowed, but in some particular Agreements, &c. I shall therefore not insist upon it; but as to the former, to wit, *Simple Interest*, I shall endeavour at some practical Rules and Methods to render it easy to the meanest Capacity; and shew also, that by the Methods of working Interest, several other useful things are answered, that do not come under that Denomination.

Example 1.

What comes the Interest of a Bond of *l.* 374-12-9 to, at 6 *l. per Cent.* for a Year?

Rule. Multiply the principal Money, by the Rate of *Interest*, be it what it will, and divide by 100. State it thus:

l P *l I* *l P s d*
If 100 gain 6, what 374 12 9
6

22|47 16 6
20

9|56
12

6|78 *l s d* 22 9 6 $\frac{3}{4}$ $\frac{22}{100}$
4

3|12

Here I multiply the third number by the second, according to *Multiplication of Money*, and the Product is *l.* 2247-16-6, which I divide by 100, by cutting off two Figures with a Dash of the Pen, which is dividing by 100, according to the 6th *Rule* of the 5th *Chapter*, then I multiply the several Remainders by 20, by 12, and by 4, and still divide by 100, as before, and the Answer is *l* 22-9-6 $\frac{3}{4}$ $\frac{22}{100}$; as may be seen by the work above.

And

And the Truth may be proved by stating and working it back again, thus:

	l.P.	*s.*	*d.*		*l. l.*	*s.*	*d.*			*l. P.*	
If	374	12	9	gain	22	9	6	$\frac{3}{4}$,	$\frac{12}{100}$,	what 100	?

Example 2.

What's the *Interest* of *l.* 826 13 9 for a Year, at 5 *per Cent.*?

Shorter thus:	
$2,\frac{1}{0}$ | 82|6 13 9	5
facit l. 41 6 8 $\frac{1}{4}$	41|33 8 9
	20
	6|68
	12
	8|25
	4
	1|00

} *l.* 41 6 8 $\frac{1}{4}$

In the shorter Method, I consider that the Rate of *Interest*, *viz.* 5 *per Cent.* is the 20th part of 100 *l.* wherefore I take that part of the principal Money, which is done only by halving it, thus: The $\frac{1}{2}$ of 8 is 4, and the $\frac{1}{2}$ of 2 is 1, or 41*l.* and the 6 cut off is (for the Cypher in $\frac{1}{20}$) 6*s* and the 13*s* 9*d* reduced into Pence, by your Head or Pen, makes 165, and supposing the 5 cut off, the $\frac{1}{2}$ of 16 is 8 Pence; and 5 reduced into Farthings make 20, and supposing the 0 to be cut off from that likewise, the $\frac{1}{2}$ of 2 is $\frac{1}{4}$, and so the Answer is the same with the other, *viz.* *l.* 41-6-8 $\frac{1}{4}$; and the most concise Method that can be.

Example 3.

What's the *Simple* Intereſt of
l. 34|8. 13 2 at 6 *per Cent?*

17 08 $7\frac{3}{4}$ { $\frac{1}{20}$ or $\frac{6}{10}$ for 5 *per Cent.*
3 09 $8\frac{3}{4}$ { $\frac{1}{5}$ for 1 *per Cent.*

Facit, l. 20 18 $4\frac{1}{2}$

Example 4.

What's the Intereſt of *l.*746-12-6 at $5\frac{1}{2}$ *p.C.*

5

3733-02-6
The $\frac{1}{2}$ of 746*l.* &c. 373-06-3

41|06-08-9
20
1|28
12
3|45
4
1|80

} *l.* 41-1-3 $\frac{3}{4}$

Sooner thus:

74|6 12 6

5 $\frac{1}{20}$ | 37 06 $7\frac{1}{2}$
$\frac{1}{10}$ | 3 14 $7\frac{3}{4}$

l. 41 01 $3\frac{1}{4}$ *facit.*

Thus by either of theſe Ways may the Intereſt of any Sum of Money, for a Year, be found, at any Rate *p. Cent.* Likewiſe by the ſame Method of Working, may the Proviſion, Commiſſion, or Factorage of any Sum be known: As alſo Inſurance, Avarage, Storeage, Brokerage, or any thing elſe, rated at ſo much *per Cent.*

What is the Factorage of Goods bought, or otherwise negotiated, to the Value of *l.* 479 16 9 at 2 *p. Cent.*

```
479 16 9

9|59 13 6
   20
11|93
   12
11|22
```

Or thus;

```
2 p. C. 1/50 | 479 16 9
Facit, l. 9 11 11
```

What is the Insurance of 230 *l.* at 10 3/4 *per Cent.*

```
10 per Cent.   230 l.
               115.
                57 10
             24|72 10 ┐
                20    │
             14|50    ├ l. 24-14-6
                12    │
              6|00    ┘
```

Or thus:

```
10 p. Ct.   l. 23|0
10s  1/20        1  3
5s   1/2           11 6
Facit l. 24 14 6
```

This Method may be of good Use; for taking off 5 *per Ct.* for prompt Payment in *Custom-House* Duties, and 15 *per Cent.* the *additional* duty on *French* and *East-India* Goods.

Admit I were to take off 5 *p. Ct.* from *l.* 275 12

```
Subtract 1/20     13 15 07
Answer,  l. 261   16 05
```

Again, take off 15 *per Cent.* from *l.* 672 16 08

```
1/10        67 05 08
1/2         33 12 10
Subtract   100 18 06
Answ. l.   571 18 02
```

Once more, take 25 *p. Cent.* from *l.* 321 12 4

5 *per* Ct. $\frac{1}{20}$ 16 01 $7\frac{1}{4}$
5

Deduct 80 08 $0\frac{1}{4}$ 25 *per* Ct.

Answer, *l.* 241 04 $3\frac{3}{4}$

Example 5.

What comes the Interest of *l.* 446-12 to, for 9 Months, at 6 *per* Ct. *per Annum*?

Here I take the $\frac{1}{2}$ of the Year's Interest, for 6 Months, and then the $\frac{1}{2}$ of that for 3 Months, and add them together for 9 Months, as in the following Work.

l. 446 12
6 *per* Ct.

26|79 12
20

15|92
12 } *l.* 26 15 11 $\frac{4}{100}$ for a Year

11|04 } 6 *mo.* 13 07 11 $\frac{1}{2}$ for $\frac{1}{2}$ a Year
3 *mo.* 6 13 11 $\frac{3}{4}$ for $\frac{1}{4}$ *ditto*

l. 20 01 11 $\frac{1}{4}$ for 9 Months

Example 6.

To what comes the Interest of *l.* 297-12 at 5 *per* Ct. for 6 Months? *Answer, l.* 7-8-9-$\frac{1}{2}$.

l. 14 17 7 for a Year.

Take $\frac{1}{2}$ for 6 Months. } *l.* 7 08 9 $\frac{1}{2}$ Answer.

When

When at any time the Rate of Intereft hath $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ annexed, you muft firft multiply by the whole Number, and then take $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$, of the principal Money, (as is taught in the 13th Rule of the 4th *Chapter*) and add the two Lines together, and then divide by 100, as before.

Example 7.

What is the Intereft of *l* 376 12 6 at $4\frac{1}{2}$ *per Cent.*?

	376	12	6
			4
	1506	10	0
For the $\frac{1}{2}$ *per Ct.* take half of the Principal.	188	06	3
	16|94	16	3
	20		
	18|96		
Anfwer *l* 16-18-11-$\frac{1}{2}$	12		
	11|55		
	4		
	2|20		

Example 8.

What is the Intereft of *l* 226 10 at $3\frac{3}{4}$ *per Cent.*

	226	10	
			$3\frac{3}{4}$
p. Ct.	679	10	0
$\frac{1}{2}$	$\frac{1}{2}$ 113	05	
$\frac{1}{4}$	$\frac{1}{2}$ 56	12	6
	8|49	07	6
	20		
	9|87		
Anfwer *l* 8-9-10-$\frac{1}{2}$	12		
	10|50		
	4		
	2|00		

Another Way (when the Time is odd, or not just a Year) is to multiply the principal by the Interest of 100 *l.* for the nominated time, cutting off two Figures to the Right Hand; as before.

Example 1.

What's the Interest of *l.* 234 12 6 for 2 Years, at 5 *per Cent.* The Int. of 2 Yrs. at 5 *p. Ct.* } 10 *l.*

23|46 05 0
20
9|25 } *l.* 23 9 3
12
3|00

Example 2.

What's the Interest of *l.* 312 16 for 5 Years, at 6 *per Ct.* 5 and 6

1564 0

93|84 0
20
16|80
12
9|60
4
2|40

Answ. *l.* 93 16 9 $\frac{2}{5}$

Here the Interest of 100 *l.* for the Time, is 30 *l.* therefore I multiply by the Ratio's of 30, *viz.* 5 and 6; as in the Example.

Exam-

Example 3.

What's the Interest of *l.* 428 14 for 9 Mon. at 4 *per* Ct.

The Inter. of 100 *l.* for 9 Mon. at 4 p. Ct. } is 3 *l.*

12	86	2
	20	
17	22	
	12	
2	64	
	4	
2	56	

} *l.* 12 17 2 $\frac{56}{100}$

When the Rate is at {5, 6, 4, 3} p. Ct. for {12, 10, 15, 20} Months

Then the Interest of any principal, is just so many Shillings as there are Pounds; therefore take $\frac{1}{20}$ of the Principal, &c.

Example 1.

What's the Interest of ——— *l.* 412 06 9 at 5 *per* Cent. for 12 Months?

$\frac{1}{20}$ 20 12 4 Answ.

Example 2.

What's the Interest of ——— *l.* 324 12 0 at 6 *per* Cent. for 10 Months?

$\frac{1}{20}$ 16 4 7 $\frac{4}{20}$ Ans.

Example. 3.

What's the Interest of ——— *l.* 428 16 4 at 4 *per Cent.* for 15 Months?

$\frac{1}{20}$	21	08	9		Ans.

Hence it necessarily follows, that the Interest of any given Principal may be found, by taking Parts for the Time proposed, out of the Time mentioned in the foregoing Table; thus: If the Interest of *l.* 412-6-9 for 12 Months, be *l.* 10-12-4, as above, at 12*d* in the Pound, then for 6 Months it must be $\frac{1}{2}$, *viz.* *l.* 10-6-2; and for three Months $\frac{1}{4}$.

Examples.

What's the Interest of ——— 20)276 05 9 for 4 Mon.

		13	16	3 $\frac{1}{4}$	
4 mon. $\frac{1}{3}$ of 12 mon.	*l.*	4	12	1	An. for 4 m.

Again, what's the Interest of 20)157 09 0 for 5 Months, at 6 *per* Cent.

		7	17	5 $\frac{1}{4}$	
5 mon, $\frac{1}{2}$ of 10 mon.	*l.*	3	18	8 $\frac{1}{2}$	Answ.

And so for 4 or 3 *per* Cent. for 15 or 20 Months, in the same manner.

When the *Principal Money* is any number of *Pounds*, without *Shillings* or *Pence*, then it may be done by the following Method of working.

Exam-

Example 1.

What's the Interest of 40 *l.* for 7 Years, 5 Months, and 26 Days, at 6 *per Cent. per Annum* ?

Years. *Mon.* *Days*
7 5 26
12 Months in a Year.

89
30 Days in a Month.

2696
40 Principal Money.

1|00)1078|40
Groats 6|0)1071|8
in all.
l 17 58 *Groats*, or 19*s* 4*d*, and 1*d* ½ for (the *Fraction*

Here the Time is set down, and multiplied by 12, the Calendar Months in a Year, and the odd Months taken in, and then by 30, the supposed Days in a Month, and the odd Days taken in likewise, which Product of Days is multiplied by the *Principal Money*, *viz.* 40 *l.* which Product is divided by 100, and then that Quotient by 60, the *Groats* in a *Pound*, and the Remainder is *Groats*, *viz.* 58, which is 19 *s* 4*d* and 1*d.* ½ for the Fraction, in all *l.* 17-19-5 ½: As in the Work.

Example 2.

What is the Interest of 590 *l.* for 3 Years, 7 Months, and 19 Days at 6 *per Cent. per Annum* ?

Years

Years	*Mon.*	*Days*
3	7	19

12 Months in a Year.

43
30 Days in a Month.

1309
590 Principal Money.

117810
6545

1\|00)7723\|10
6\|0)772\|3

Anſ. l. 128 - 43 Groats, or 14*s* 4*d*. In all, *l.* 128-14-4.

There is alſo another Way of calculating *Intereſt*, by Days, which is thus: Bring the *Principal Money* into *Pence*, then multiply them Pence by the Days it is out at Intereſt, and if the Rate be at 6 *per Cent.* then divide by 6083, which is what is produced by the Days of a Year multiplied by 100, and divided by the Rate of Intereſt; but if the Rate be 5 *per Cent.* then divide by 7300.

Example.

What is the Intereſt of 150 *l.* for 10 Months and 24 Days, at 5 *per Cent. per Annum?*

```
l. 150                                        Mo. Days
    20                                         10 - 24
------                                         30
  3000                                        ----
    12                                         324
------                                        (12
 36000          73|00)11664000(1597
   324 Days at Interest                        1313
------                                       ------
144000                                  Ans. l. 6-13-1
72000                                   ------ ------
108000
------
11664000
```

Another Rule by Days.

Multiply these three Numbers continually, *viz.* the given Interest of 100 *l.* for a Year; the principal whose Interest is required; And lastly, the Number of Days, required; and the last Product is to be reserved for a Dividend. Then multiply 365 Days by 100, (which is only annexing two Cyphers) and let that Product be your Divisor; (which serves for all Rates) and then divide as usual, and the Quotient will be the Interest sought.

Note here, That the two Principals, *viz.* 100 *l.* and the other propos'd, are suppos'd to be of one Denomination; also the Interest required will be of the same Name with the given Interest of 400 *l.*

Example.

What's the Interest of 400 *l.* for a Week, or 7 Days, at 6 *per Cent. per Annum?*

$$\begin{array}{rr} & 400 \\ & 6 \\ \hline 365 & 2400 \\ 100 & 7 \\ \hline 36500 \text{ Divisor} &)16800(\text{ Dividend} \end{array}$$

Anſ.

36500)16800,000(,4602 or 9*s* 2*d* $\frac{1}{4}$

Here, in valuing, the Farthings are always leſſened by one.

When the Rate is 5*s per Cent.* take the $\frac{1}{4}$ of the Principal, and work as before.

What is the *Brokerage* of *l.* 465 12 6 at 10*s per Cent.*?

$$\begin{array}{rrr} 465 & 12 & 6 \\ \hline \tfrac{1}{2}\ 2132 & 16 & 3 \\ 20 & & \\ \hline 6156 & & \\ 12 & & \\ \hline 6175 & & \\ 4 & & \\ \hline 3100 & & \end{array}$$

Anſw. *l.* 2-6-6 $\frac{3}{4}$.

If you would know what any Sum comes to, at 30, 40, or 50 *per Cent.* firſt ſee what it comes to at 10 *per Cent.* and then multiply that Anſwer by 3, 4 or 5, &c.

Example

Example.

What comes *l.* 726 10 6 to, at 40 *per Cent.*

```
                              10
                          ----------
                          72|65 05 0
l. 72-13-0 1/2       10 per Ct. 20
           4              -------
-----------------         13|05
l. 290-12-2 Answer.          12
-----------------          ----
                             60
                              4
                           ----
                           2|40
```

CHAP. XVI.

DISCOUNT.

IS when a Sum of Money hereafter due, is satisfied by paying down so much present Money, which if put to Interest (at such a Rate, and for such a Time) would encrease it self to the Sum first due.

Example 1. What is the *Discount* of *l.* 487-12 for six Months, at 6 *per Cent. per Annum*?

To answer this, and other Sums of the same kind, the general Rule is, to make 12 Months the first Number in the *Rule of Three*, the Rate of *Interest* the second, and the Discounted Time the third.

If 12 Months give 6 *l.* what 6 Months?

```
                   6
              -------
              12)36
              -------
                   3 To be added to 100 l. the first
                                          Number
```

Number in the next Work. Then say again, If 103 *l.* abate 3 *l.* what *l.* 487-12. Answer *l.* 14-4 *Discount.* *See the following Proof.*

After I find the Discount to be *l.* 14-4, I deduct it from the Sum first due, *viz.* *l.* 487-12, and the Remainder is the present Money to be paid down: And for the Proof of the Assertion in the first Rule, I take the Sum to be paid down, and calculate it at 6 *per Cent.* the Rate of Interest propos'd, and the Answer is *l.* 28-8, the Interest for a Year; the $\frac{1}{2}$ of which for 6 Months, (the Time discounted) is *l.* 14-4, the *discounted Sum:* As by the following Work.

l. 487	12	first due
14	04	discounted
473	08	to pay down
	6	*per Cent.*
28|42	0	
20		
8|40		
Int. for a Y. l. 28-8		
$\frac{1}{2}$ for 6 *Mo. l.* 14-4 Proof		

From whence it is manifest, no one allows Interest for any more Money than he receives.

Ex. 2. What is the Discount of 275 *l.* 10 *s.* for 7 Months, at 5 *per Cent.* *per Annum?*

		5 *l. per Cent.*
6 Mo.	$\frac{1}{2}$	2 10
1 Mo	$\frac{1}{6}$	0 08 4
		l. 2 18 4

If

If *l* 102-18-4 abate *l* 2-18-4, what *l* 275-10? Ans. *l* 7-16-1.

First due,	*l* 275-10
Discounted,	7-16-1
Paid down,	267-13-11
	5 *p.* C.

13138-09-07
20

7169
12

8135
4

1140

	l	*s*	*d*
Interest	13	7	8 $\frac{1}{4}$
6 Mo. $\frac{1}{2}$	6-13-10		
1 Mo. $\frac{1}{6}$	1-02-03		
Proof.	7-16-01		

Example 3.

Bought Goods to the Value of *l* 109-10, on 9 Months Discount, at 6 *per Ct. per Annum*, what must be paid down?

6 *l. per Cent.*

6 Mo. $\frac{1}{2}$	3 00
3 Mo. $\frac{1}{2}$	1 10
	4 10
	100

If *l.* 104 10 abate *l* 4 10, what 109 10?
Ans. l 4-14-3 4 14 3

Answer, to be paid down, *l.* 104 15 9

Example

Example 4.

Sold Goods amounting to *l.* 217-12, on two 3 Months Discount, (that is half at 3 Months, and the other half 3 Months after that) at 5 *per Cent. per Annum*, what must be paid down?

5 *l. per Cent.*

3 M. $\frac{1}{4}$ 1 5
100 0

101 5

If *l.* 101-05 abate *l.* 1-5, wt *l* 108-16
Ans. *l.* 1-06-10 Disc.

l. 217-12
108-16 2 Parts.

Again.

If *l* 102-16 dis. *l* 2-10, wt *l.* 108-16
Ans. *l.* 2-13-0 Disc:
217-12 val. sold

5 *per Ct.*

6 M. $\frac{1}{2}$ 2 10
109 00

102 10

l. 108-16 for 3 *m.* 1-06-10 Disc.
108-16 for 6 *m.* 2-13-00 Disc.

Total Discount, 3-19-10

Paid down, *l.* 213-12-02 *Ans.*

In the foregoing Example, I first divide the given Sum into two equal Parts, by taking the half of it; then for 3 Month I take $\frac{1}{4}$ Part of the Rate, *viz.* 5 *per Cent.* and it makes *l.* 1-5. Then I add that *Facit* to 100 *l.* and make the first *Stating*, saying, If *l.* 101-5 Discount *l* 1-5, what *l* 108-16? and the Answer is *l* 1-6-10, for the first 3 Months Discount. Then for 6 Months I take the $\frac{1}{2}$ of the Rate, and it makes *l.* 2-10: Then I say again, If *l* 102-10 abate *l* 2-10, what *l* 108-16? and the Answer is *l* 2-13. for 6 Months Discount. Then I add the two Discounts together, and subtract the Total from the *Sum* first due, and the Remainder is *l.* 213-12-2 to be paid down presently. Which may be seen by the Work.

When

When the Payments are to be made at three several Times, then divide the given *Sum* into three equal Parts, and work as before; and if at 4 Payments, then divide the Sum into 4 equal Parts, &c.

There is another and better Way, when the Rate is at 6 *per Cent.* Discount, which is thus:

Bring the given Sum into Pence, and then multiply those by the Time, which Product divide by 200, and the Time added together, and the Quotient will be the Answer in Pence, which reduce into Pounds, &c.

Example. 5.

For Tryal, let us take the first Example in this Rule; *viz.*

What is the Discount of *l.* 487 12 for 6 Months, at 6 *per Cent.*

```
                         l. 487  12
                                 20
                         ----------
                              9752
                                12
                         ----------
     200                   117024 Pence
       6                        6 Months Time
     ---                   ----------------
Divisor, 206           206)702144(3408 Pence
     ---                   618
                           ---
    12)3408 Pence           841
    ---------               824
        28|4                ---
       -----                1744
Discount l. 14-4            1648
       -----                ----
                            (96)
             l. 487 12 First due
                 14 04
             ---------
      Ans. l. 473 08 to pay down
             =========
```

A

A third Way of Discount is to multiply 12 Months by 100, (which is only annexing two Cyphers to 12) and divide the Product by the rate of Discount, and to that Quotient add the Time proposed; which Sum reserve for a Divisor: Then multiply the Sum to be discounted by the proposed Time, and divide that Product by the above-mentioned Divisor.

Example 6.

What's the Discount of *l.* 487-12, for 6 Months, at 6 *per Cent. per Annum*, (the first Example in this Rule)?

12	Sum to be discounted.	*l.* 487 12
100		6 Months.
Rate 6)1200		206)2925 12(14 *l.*
		206
200		865
Time added 6		824
Divisor, 206		41
		20
Answ. *l.* 14 4 to be disc.		832(4*s.*
		824
		(8)

Example 7.

What present Money will discharge a Debt of 122 *l.* 11*s.* 4*d.* due at 3 Months, discounting after the rate of 6 *per Cent. per Annum*? Answer, *l.* 120-15-1 ½.

After the last Method of Operation.

	l.	*s.*		*l.*	*s.*	*d.*	
Divisor, 203)	367	14	(	1	16	2 ½	Discount.

&c.

Exam-

Example 8.

What's the Discount of *l.*275-10, for 7 Months, at 5 *per Cent. per Annum*? *Answ. l.* 7-16-1 $\frac{3}{4}$

As before.

	l.	*s.*	*l.*	*s.*	*d.*	
Divisor, 247)	1928	10 (	7	16	1 $\frac{3}{4}$	Discount.

&c.

For				with the Time added, is the Divisor.
	2	*per Cent.* Discount.	600	
	3		400	
	4		300	
	5		240	
	6		200	
	7		171	
	8		150	
	9		133	
	10		120	

When the Discount of any Sum is at any of the Rates in the Table above, *viz.* from 2 to 10, then the opposite Numbers, with the Time of Discount added to them, will be proper Divisors for your intended Purpose, and are found by dividing 1200 by the Rate of Discount; according to the Rule of the third Method of Discount.

If the Discount be 20, 30, or 40 *per Cent.* then cut off a Cypher from 600, 400, 300, *&c.* and add the Time to 60, 30, or 40, for the Divisor, *&c.*

Example 9.

What is the Discount of *l.* 212-15, for 3 Months, at 40 *per Cent. per Annum*?

According to Rule, I add 3 (the Time) to 30, and it makes 33 for a Divisor, *&c.*

212 15
3

33)638 05(*l.* 19-6-9 $\frac{3}{4}$ $\frac{3}{11}$ Answer.
&c.

CHAP.

CHAP. XVII.

EXCHANGE.

IS the receiving of Money in one Country, or Nation, and paying it again in another, Value for Value, having respect to the several *Species* of Coin, or Money of each Nation.

Exchange of Coins, is like the Business of exchanging or bartering of Goods, and depends on a clear Understanding of the *Golden Rule*, to find what Sum of one Country's Money will be equal in Value to any proposed Sum of another Country's Money: In order to which, it is very necessary to have at all times a true Account of the just Values of those Foreign Coins that are to be exchanged, as they are compar'd in Value to our *English*, at all times, as abovesaid, because the *Par* of Exchange differs almost every Day, from *London* to other Countries, that is, it rises and falls, *&c.*

The Way of working *Exchange* is, either by the *Rule of Three*, or by *Practice*, and most commonly by the latter.

London exchanges with *Holland*, *Flanders*, *&c.* upon so many *Shillings* and Pence *Flemish* for the Pound *Sterling*; the *Par* being 33*s* 4*d* *Flem.*

Dutch Money.	Sterl. Val. *s.*	*d.*
2 Groats, 1 *Stiver*		
1 *Stiver*	0	1 $\frac{1}{5}$
6 *Stivers*, 1 Skilling *Flem.*	0	7 $\frac{1}{5}$
20 *Stivers*, 1 *Guilder*	2	0
6 *Guilders*, 1 Pound *Flem.* of 20 *s.*	12	0
33*s* 4*d* *Flemish*, or 10 *Guilders*	20	0
A common *Dollar*	3	0
A Specie *Dollar*	5	0

Example

Example 1.

Remitted from *London* to *Amsterdam* a Bill of *Exchange* of *l* 285-10 *Sterling*, the Exchange at 33*s* 9*d Flem. per Pound Ster.* how many *Guilders Flemish* must the Bill be drawn for? Ans. 2890 *Guilders* 13 *Stivers*,

Work'd thus:

If 20*s Ster.* give 33*s* 9*d Flem.* what *l* 285 10 *Sterling*?

```
           12                  20
          ----               ------
          405                 5710
                               405
                             ------
                             28550
                            228400
                           --------
                      2|0)2312551|0
                           --------
2 Groats 1 Stiver      2) 115627-10
                           --------
20 Stivers 1 Guilder  2|0)578|13
                           --------
           Answer, 2890-13
```

When you would know your Gain, or how much the Exchange is in your Favour, subtract the *Par* from the Course, or Price of the Exchange, and the Difference is the Gain *per Pound Flemish*, as here it is but 5*d*. And so the contrary for Loss, &c.

Example 2.

A Merchant in *Rotterdam* remits a Bill of *Exchange* of 7621 *Guilders*, 7 *Stivers*, to be paid in *London*, how much *Sterling* Money must the said Bill be drawn for, the Exchange at 33*s* 4*d Flem. per Pound Sterling*?

Answ. *l* 762-2-8.

If 33*s*

			Guild.	*Stiv.*
If 33*s* 4*d. Flem.* gives	20*s Sterl.*	what	7621	7
12	12		20	
400	240		152427	
			2	*Greats.*
			304854	
			240	
			121941 60	
			609708	
			4[00)731649[60	
			12)182912	
			2[0)15241[2--8	
		Anſ. l	762-02-8	

Sterling Money may be brought into *Flemiſh* Money by *Practice*, thus: Conſider how much the Rate of Exchange is above a Pound *Sterling*, which reduce to the Parts of a Pound, and take thoſe Parts of the *Sterling* Money, and add them to the *Sterling* Money, which Total multiply by 6, becauſe 6 *Guilders* make a Pound *Flemiſh*, and the Product will be the Anſwer.

Example.

The Anſwer to the 2d *Example* of *Flemiſh* Money, reduced to *Sterling* Money, is

Here the Difference is 13*s* 4*d*, or $\frac{2}{3}$ of a *l.* wherefore I take $\frac{2}{3}$ of *l.* 762-2-8, and add the Reſults to it, and it makes 7621 *Guilders* 6 *Stivers*, 8 *Pennings*, or 1 *Groat*; as by the *Rule of Three*.

l	762	2	08	
	254	0	10	$\frac{2}{3}$
	254	0	10	$\frac{2}{3}$
	1270	4	05	$\frac{1}{3}$
				6
Guild.	7621	6	08	

Or

Or *Flemish* Money may be brought into *Sterling* Money, by bringing the Course or Rate of Exchange into Pence, for a Divisor; and the *Flemish* Money into Pence likewise, for a Dividend; and the Quotient will be the Answer, in *Sterling* Money.

Example 3.

For how much *Sterling* Money must a Bill be drawn, for Goods bought in *Holland*, amounting to 11715 *Guild.* 12 *Stivers*, the Exchange at 34*s* 8*d Flem. per* pound *Ster.*

```
  s.  d.        Guild.
  34  8         11715 12 Sti.
  12               40 Groats
 ------        --------
 416 Divis. )468624(l 1126 10 Ster.

               (208) Remaind.
                 20
               -----
               4160(10s
               4160
              ------
```

London Exchanges with *France* upon the *French* Crown, whose *Par* is 54*d*; that is, to pay so many *Pence*, or *Shillings* and *Pence*, for the *French* Crown.

French Money.	Val. sterl. s.	d.
12 *Deniers* 1 *Soulz* ————————	0	0 $\frac{3}{4},\frac{1}{5}$
20 *Soulz* 1 *Livre* ————————	1	6
3 *Livres* 1 *Crown*. ————————	4	6

Example 4.

If I draw a Bill *per* Exchange *l.* 210-17-10 *Sterling*, to be paid in *Paris*, the Exchange at 57 *d* $\frac{1}{2}$, for how many Crowns must I draw the Bill?

Ans. 886 *Fr. Cr.* 0 *Liv* 1 *Soulz*.

London Exchanges with *Venice* upon the *Ducat* of 52 *d* and with *Legborn* upon the *Dollar*, or *Pcs.* of $\frac{8}{8}$ of 54*d.*

Italian Money.	Sterl. Val.	
1 *Livre* at *Legborn*	*s* 0	9
1 *Crown* currant at *Florence*	5	3
1 *Ducat de Banco* at *Venice*	4	4
1 St. *Mark* at ditto	2	10
1 *Palermo* Florin	2	6

When a Comparifon is made between *Foreign Coins* of one Country and another, fuch Queftions may be anfwered by the *Single Rule of Three Inverfe.*

Example 11.

How many *Spanifh Ducats*, at 4*s* 4*d* muft be drawn for 700 *Rix Dollars*, at 5*s* 6*d.*

If 700 —— 5*s* 6*d* —— 4*s* 4*d*?

12	12
66	52
700	

52)46200(888 $\frac{24}{52}$ Anf.
416
460
416
440
416
(24)

CHAP.

CHAP. XVIII.

PROFIT and *LOSS*.

Example 1.

IF I buy 220 Yards of *Broad Cloth* at 8*s* 6*d per* Yard, and sell it again at 10*s* 4*d per* Yard, what do I gain by the whole?

First find the difference by *Subtraction*, between the Price bought, and the Price sold for; then by *Practice* cast up the Number of Yards by that Difference, as underneath.

s	*d*	
10	4	Sold for
8	6	Bought for
1	10	Difference.

		220 Yards at 1*s* 10*d*		Or thus
6*d*	$\frac{1}{2}$	110		220
4*d*	$\frac{1}{3}$	73-4		22
		40|-3-4	Subtract $\frac{2}{120}$	1 16 8
		Answ. *l* 20-3-4 Total Gain.		*l* 20 03 4

Example 2. If a Draper buy 750 Ells of *Holland*, for *l* 81-5, how must it be sold *per* Ell, to gain *l* 21-17-6 in the whole? *Ans.* 2*s* 9*d*

Here the intended Gain must be added to the Prime-cost, which makes *l* 103-2-6. Then say,

If 750 Ells cost *l* 103-2-6, what 1 Ell? And the Answer will be 2*s* 9*d per* Ell. And for so much must he sell it *per* Ell, to gain *l* 21-17-6 in the Whole.

And for Proof, see by *Practise* what 750 Ells comes to, at 2*s.* 9*d.* and you will find it amount to *l.* 103-2-6.

Example 3. Admit a Merchant to buy Goods to the Value of 425*l.* and offers them again for *l.* 15 *per Cent.* Profit, what come they to? State it thus:

If *l.* 100 gain *l.* 115 what *l* 425
115
———
2125
425
425
———
488|75
20
———
15|00
Ans. *l* 488-15

Or thus:
425 at 15 *per Cent.*
4 Hundred under 15 *per Cent.*
———
l. 60
25 is $\frac{1}{4}$ of 100 *l.* 3-15, or $\frac{1}{4}$ of 15 *l.*
———
l. 63-15 Profit.
Add 425-00 Prime Cost.
———
Ans. *l.* 488-15 What they must be sold for, as before.

Example 4. If I buy 500 Pair of Silk Hose, at *s.* 6 *d.* *per* Pair, how much must I sell them for *per* Pair, to gain 20 *per Cent.* Profit?

First see what they come to at 8 *s.* 6 *d.* *per* Pair; thus:

500 Pair at 8 *s.* 6 *d.*
8
———
4000
6 *d* $\frac{1}{2}$ 250
———
425|0
———
Answ. *l.* 212-10

Then

Then see what *l.* 212-10 comes to at 30 *per* Cent.
10 *per* Cent.

```
21|25-00
   20
-------
  5|00
```

l. 21-5 10 *per* Ct.
3

30 *per* Ct. Profit, *l.* 63-15 } Answ.
prime cost, 212-10 } add,

l. 276-05

Then say, If 500 pair cost *l.* 276-5, what 1 pair? *Answ.* 11*s* 0*d* $\frac{1}{2}$, $\frac{2}{5}$.

Example 5. A Halfpenny in the Shilling, what is that *per cent.*

```
   l. 100
       20
   ----------
½)2000 Shillings
   ----------
12)1000
   ----------
   8|3-4
```

Anf. 4-3-4 *per Cent.*

Or thus,

```
4)100
-----
6)25
-----
l. 4-3-4
```

A Penny in the Shilling is as much again; 2*d* four times as much, 3*d* six times as much, &c. So you may multiply it either by 2, 4 or 6, to know how much you gain *per* Cent. at them Rates in a Shilling, &c. Or consider what part of a Shilling your Profit is, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, or $\frac{1}{5}$, &c. and take that Part of a 100 *l.* and the Quotient will be what such Profit in a Shilling makes *per Cent*?

Example 6. As suppose 2*d* in the Shilling be your Profit, Twopence we know is the $\frac{1}{6}$ of a Shilling, wherefore I take the 6th part of 100 *l.* thus:

 6)100 *l.*

6)100 *l.*

Anſ. *l.* 16-13-4

In the laſt Example, $\frac{1}{2}d$ in the Shilling was *l.* 4-3-4 *per cent.* where, if you multiply by four, the Halfpence in 2*d*, you'll find the ſame Anſwer *l.* 16-13-4 Proof. And ſo the contrary.

Again, Admit I gain 3*d* $\frac{1}{2}$, or 5*d.* in the Shilling, what is that *per cent*?

Here in regard that 3*d* $\frac{1}{2}$ is $\frac{7}{24}$, and 5*d* $\frac{5}{12}$ of a Shilling I multiply 100 by the Numerator, and divide by the Denominator, according to the 4th Table at the Beginning of the Rule of *Practice*; thus:

	100	100
3*d* $\frac{1}{2}$ in the 1*s*	7 Halfpence	5 pence in the 1*s* (*i. e.* $\frac{5}{12}$
	4)700	12)500
	6)175	*l.* 41 $\frac{8}{12}$ or $\frac{2}{3}$, *i. e.* 13*s* 4*d*

Anſ. *l.* 29 $\frac{1}{6}$, or 3*s.* 4*d.*

As whatever Part of a Shilling is your Profit, the ſame *per cent* will be your Profit alſo: ſo on the contrary, whatever part of 100 *l.* is your Profit, the ſame part of a Shilling will be your Profit likewiſe. As ſuppoſe your Gain be 25 *per cent*, which is the 4th part of 100 *l.* ſo your Gain in a Shilling will be 3*d*, at the Rate of 25 *per cent.* for as 25 is the 4th of 100, ſo is 3 of 12.

Example 7. If I propoſe to get in any Goods 20 *l per cent.* profit, what is that in a Shilling? 20 *l.* is the 5th part of 100 *l.* wherefore take the 5th Part of a Shilling for the profit; thus:

5)12*d*

2 $\frac{1}{4}$ $\frac{3}{5}$

Example

Example 8. Suppose I have Goods to the Value of *l* 415-12-6, that come to a bad Market, and know that they impair by lying, I therefore am obliged to sell them at 12 *per Cent.* Loss, what come they to?

Here the Loss must be subtracted from 100*l* and the Remainder is the middle Number.

From *l* 100	If 100*l*	88*l* what *l* 415 12 6
take 12		*Ans.* 365 15 0
88		Lost in all, *l* 49 17 6

Or thus: See what *l* 415-12-6 comes to at 12 *per* Ct and subtract that from the Cost of the Goods.

l 415-12-6	
12	
l 49|87-10	
20	
s 17|50	From *l* 415 12 6
12	take 49 17 6
d 6|00	*Ans. l*, 365 15 0

If *Deal* Boards be bought at 18*d per Piece*, and sold again at 21*d* what is that *per Cent.* Profit?

Answer, *l* 161-3-4, thus:

If 18*d* gain 3*d*, what 100*l*

If I buy Cinamon for 6*s* 7*d* per ℔ and sell it again for 5*s* 9*d* what is lost *per Cent.* *Ans. l* 12 13 1 $\frac{18}{79}$

If 6*s* 7*d* lose 10*d* what 100*l*

There are two or three other Rules, which might be introduc'd, such as *Alligation Medial* and *Alternate*; and the *Rule of False*; but they being more for Amusement than real Use, I shall omit them, and, in the next Place, say something of *Fractions.*

CHAP. XIX.

Of FRACTIONS, Vulgar and Decimal.

NUMERATION.

I. A *Fraction* is part of a whole Number, and arises from *Division*, (as was said before) and hath these two Parts, *viz.* *Numerator* and *Denominator*, which have a short Line between them, and set thus:

Remainder	5	Numerator.
Divisor	8	Denominator.

The Numerator expresses the Number of parts, and the Denominator giveth to those parts their Names. As suppose 277 *l.* be divided among 8 Men, the Quotient will be 34 *l* the Share to each Man; and there will be a Remainder of 5, and must be set over the *Divisor* 8 thus, $\frac{5}{8}$; and signifies, that if a *l* or 20*s* were divided into 8 parts, each Man must have 5 of those 8 parts, (or $\frac{1}{2}$ Crowns) more to his Share, as was before hinted.

II. A Vulgar Fraction is either *Simple* or *Compound*.

III. A Simple Vulgar Fraction is that which hath only one Numerator, and one Denominator, and is either Proper or Improper.

IV. A Proper Fraction hath always its Denominator greater than its Numerator, as $\frac{3}{4}$, $\frac{7}{8}$, $\frac{12}{20}$, &c.

V. An Improper Fraction hath its Denominator always greater than its Numerator, as $\frac{5}{3}$, $\frac{9}{4}$, $\frac{30}{12}$, &c.

VI. Compound Fractions consist of divers Numerators and Denominators, and is known by this particle [*of*] being between them; and are therefore sometimes called

Fractions

Fractions of Fractions; as $\frac{2}{3}$ of $\frac{5}{6}$ of $\frac{7}{8}$, that is, two thirds of five sixths of seven eighths.

VII. Fractions are of two Kinds, *Vulgar* and *Decimal*. What *Vulgar* Fractions are, hath been declared already. A *Decimal* Fraction is an artificial Way of expressing Vulgar Fractions, by setting down the Numerators only; the Denominators being understood, but not expressed; and is always a Unit, with as many Cyphers annexed as there are Places in the Numerator; and therefore must be either 10, 100, 10000, 100000, *&c.*

VIII. A Decimal Fraction is distinguish'd from a whole Number, by a *Comma*, or Point prefix'd thus, ,5 and signifies 5 tenths of an Integer. So the following Fractions are exhibited vulgarly and decimally, *viz.*

	Vulgarly.	Decimally.
7 Tenths,	$\frac{7}{10}$	,7
35 Hundredths,	$\frac{35}{100}$	,35
327 Thousandths,	$\frac{327}{1000}$	,327
64 Ten Thousandths,	$\frac{64}{10000}$	,0064
108 Hundred Thous.	$\frac{108}{100000}$	,00108

In Decimals $\frac{1}{4}$ of any thing is ,25; $\frac{1}{2}$ of *ditto*, is ,5: $\frac{3}{4}$ is ,75.

IX. As whole Numbers increase by a Ten-fold Proportion from the Unit's Place, to the Left Hand; so Decimals decrease by the same Proportion, from Unity to the Right Hand, as may be seen in the following Table.

8 | 277
34 (5) each man's share

Integers

Integers							Decimals					
Millions	*C. of Thousands*	*X's of Thousands*	*Thousands*	*Hundreds*	*Tens*		*Tenth Parts*	*Hundredths*	*Thousandths*	*X Thousandths*	*C Thousandths*	*Millions of Parts*
7	6	5	4	3	2	1	2	3	4	5	6	7
Seventh Place	*Sixth Place*	*Fifth Place*	*Fourth Place*	*Third Place*	*Second Place*	Units.	*Primes*	*Seconds*	*Thirds*	*Fourths*	*Fifths*	*Sixths*

Integers, or whole increasing Numbers. | Decimals, or Fractional decreasing Numbers.

Here the Figure 2 in the Integers signifies 2 Tens, or twice 10 Units; but the Figure 2 in the Decimals, signifies but 2, or 2 Tenths of Unity, or one.

X. The Order of Places in whole Numbers is from the Right Hand to the Left; but in Decimals it is from the Left Hand to the Right. So in this Decimal ,456, the Figure 4 stands in the first Place, and is 4 *Primes*, or 4 Tenths of an Integer; and 5, the second Figure, is 5 Seconds, or Five hundredth Parts of an Integer, &c.

XI. Cyphers before Integers, and after Decimals, are of no Value; but after Integers, and before Decimals, they have their Value: For, in Integers they increase, and in Decimals they decrease the Value of the Figure join'd with them. For 4, and 04, and 004, in whole Numbers, is still but four; but in Decimals, 4, by having a Point prefix'd, thus, ,4 is decreased from 4 Integers to $\frac{4}{10}$ of an Integer, and ,04 to 4 Hundredth Parts of an Integer, &c. Again, in whole Numbers, 30 is Thirty, and 300 is Three hundred; but in Decimals, ,30 or ,300 is still but $\frac{3}{10}$ of an Integer.

Reduction

Reduction of Fractions, is to bring a Fraction into a common, or into the least Denomination; thereby preparing Fractions to be added, subtracted, multiplied, or divided.

XII. To reduce Fractions that have unequal Denominators, to Fractions of one common Denominator.

The Rule.

Multiply each Numerator into all the Denominators, (except its own) and take the respective Products for new Numerators. 2*dly*, Multiply all the Denominators continually; so shall that Product be a new Denominator, common to all the Numerators found before.

Example

Reduce $\frac{2}{5}$, $\frac{3}{7}$, and $\frac{8}{9}$ of a pound, to a common Denominator.

The first 2 the 2d, 5 the 3d 8 Denominator.

7	3	7	5
14	15	56	7
9	9	5	35
			9
$\frac{2}{5}\left\{\frac{126}{315}\right.$	$\frac{3}{7}\left\{\frac{135}{315}\right.$	$\frac{8}{9}\left\{\frac{280}{315}\right.$	315 Com. Denominat.

Here I first multiply 2 by 7, and the Product is 14, which I multiply by 9, and the Result is 126, for the first Numerator. Again, I multiply 3 by 5, and the Product is 15, which multiplied by 9, makes 135, for the second Numerator: Then I multiply 8 by 7, and the Product is 56, which multiplied by 5 produces 280, for the last Numerator. Last of all, I multiply 5, 7, and 9, the several Denominators together, and their Product is 315, for the common Denominator to all the Fractions. *See the Work above.*

Reduce

Reduce $\frac{1}{2}$, and $\frac{5}{8}$ — $\frac{8}{16}$, $\frac{10}{16}$
Reduce $\frac{7}{11}$, and $\frac{11}{12}$ — $\frac{84}{132}$, $\frac{121}{132}$ } *facit.*
Reduce $\frac{3}{7}$, and $\frac{5}{19}$ — $\frac{57}{133}$, $\frac{35}{133}$

To prove your Work, divide the new Numerator by the Numerator of the Fraction; and also divide the common Denominator by the Denominator of the Fraction; and if both Quotients are alike, the Work is right.

III. *Abbreviation*, or how to bring a Fraction into its lowest Denomination.

The Rule.

Divide both Numerator and Denominator by such a Number as will leave no Remainder in either of them. When the Numerator and Denominator are both even Numbers, they may be reduced by halving, or dividing them by 2.

Example, Reduce $\frac{12}{28}$ into its lowest Terms, or Denomination.

$$2\left\{\frac{12}{28}\right|\frac{6}{14}\left|\frac{3}{7}\text{ Answer }\frac{3}{7}\right.$$

Here I say, the $\frac{1}{2}$ of 12 is 6, and $\frac{1}{2}$ of 28 is 14; and then again the $\frac{1}{2}$ of 6 is 3, and the $\frac{1}{2}$ of 14 is 7: So is the Fraction $\frac{12}{28}$ reduced to $\frac{3}{7}$ its lowest Terms; and $\frac{3}{7}$ of any thing is equal in Value to $\frac{12}{28}$. Or if you had divided the said Fraction by 4, it had been reduced at once; for the 4's in 12 is 3 times, and the 4's in 28, 7 times, or $\frac{3}{7}$, as before.

When you can no longer halve the Fraction, then divide it either by 3, 4, 5, 6, 7, &c. if any of them so divide as to leave no Remainder. And after you have divided by a greater, you may after divide by a lesser Number, to reduce the Fraction lower still.

Example

Example. Reduce $\frac{84}{168}$ into its lowest Denomination.

$$\frac{1}{2}\left\{\begin{array}{c|c|c|c|c|c|c|c|c|c} & \text{by} & & \text{by} & & \text{by} & & & & \\ 84 & 2 & 42 & 7 & 21 & 3 & 3 & 1 & & \\ \hline 168 & 2 & 84 & 7 & 42 & 3 & 6 & 2 & & \end{array}\right\}\text{Ans. } \frac{1}{2}$$

Here I first take the $\frac{1}{2}$, or divide it by 2, and then by 2 again; and then by 7, and then by 3, which brings the Fraction into $\frac{1}{2}$, its lowest Terms.

(3.) If the Fraction, *viz.* Numerator and Denominator, end each with a Figure of 5, or a Cypher, or the one with a 5, and the other with a Cypher, divide each of them by 3, and the Quotient will be a new Numerator and Denominator.

Example. Reduce $\frac{55}{80}$, and $\frac{75}{95}$ into their lowest Terms.

$$5\left\{\begin{array}{c|c} 55 & 11 \\ \hline 80 & 16 \end{array}\right\}\text{ Answer, } \frac{11}{16}$$

$$5\left\{\begin{array}{c|c} 75 & 15 \\ \hline 95 & 19 \end{array}\right\}\text{ Answer, } \frac{15}{19}.$$

(4) There is a Way of reducing a Fraction into its lowest Name by a common Measure, which is thus:

Divide the Denominator by the Numerator, and if any thing remain, divide your last Divisor thereby, and if any thing yet remains, divide the foregoing Divisor by it; and so you must do till nothing remains, and then the last Divisor is the common Measure required, which will divide both Numerator and Denominator, without leaving any Remainder; and so reduce the Fraction into its lowest Terms at once. But if your last Divisor be 1, the Fraction is in its lowest Name already.

Example.

Example. Reduce $\frac{128}{144}$ into its loweſt Terms, by a common Meaſure.

$$\begin{array}{l} 128)144(1 \\ \quad 128 \\ \hline \quad\quad 16)128(8 \\ \quad\quad\quad 128 \\ \hline \quad\quad\quad (0) \end{array} \qquad \begin{array}{l} 16)128(8 \\ \quad 128 \\ \hline \quad (0) \\ 16)144(9 \\ \quad 144 \\ \hline \quad (0) \end{array}$$

Here I firſt divide 144 by 128, and there remains 16; by which I divide the laſt Diviſor 128, and there remains (0), wherefore 16, the laſt Diviſor, is the common Meaſure ſought for, and doth divide both Numerator and Denominator, and leaves no Remainder, (as may be ſeen in the Work above) and reduces the Fraction into $\frac{8}{9}$, its loweſt Terms.

But I prefer the other Way, in common Buſineſs, before this latter; for the Time ſpent in finding the common Meaſure, is longer than that ſpent in reducing the Fraction the other Way.

It is very expeditious in many Caſes to work Fractionally, *viz.* to multiply by the Numerator, and to divide by the Denominator of a Fraction in its loweſt Terms.

Example. What comes a hundred Weight to at *6d* $\frac{1}{2}$ *per* Pound? Conſider that $\frac{112}{240}$, in its loweſt Terms, is $\frac{7}{15}$, wherefore multiply *6d* $\frac{1}{2}$ by 7, and divide by 15, thus:

$$\begin{array}{l} 6d\ \frac{1}{2} \\ \quad 7 \\ \hline 3)45\ \frac{1}{2}\ \text{Rem. } \frac{2}{3}, \text{ or } 8d \\ \hline 5)15 \end{array}$$

Anſ. *l* 3--0--8 *per* C.

Or

Or if you double the Price of a Pound, and multiply by 7 and by 8, as follows, you have the Answer.

			6*d* $\frac{1}{2}$
	s.	1	1
			7
		7	7
			8
Anſ. *l.*	3	0	8

Or contrarywiſe, you have the price of a Pound, thus:

7)60*s*	8*d*	
8) 8	8	
2) 1	1	
	6*d* $\frac{1}{2}$	Anſwer

Any Goods ſold by the Long Hundred in Tale, or 120 to the Hundred, as *Linnen*, *Fiſh*, *Deals*, *&c.* being $\frac{125}{240}$, multiply the Price of one by 6, and divide that Product by 12, thus:

Example. *Fiſh* at 3*d* $\frac{1}{2}$ a Piece.

6
12)21
l. 1 $\frac{9}{12}$ or 15*s.*

When Things are ſold by the 1000, as *Bricks*, *Tyles*, *Hoops*, *&c.* ſtanding thus, $\frac{1000}{240}$, then multiply the Price of one by 50, and divide by 12, it gives the Price of 1000.

Ex-

Example. *Oranges* at 2*d* a Piece.

50

---

12)100

Anf. *l.* 8 $\frac{4}{12}$ or 6*s* 8*d per* Thoufand

12

---

50)100 0 0 contrary.

2*d.* a Piece.

Or any thing fold by the 1000, may be done by multiplying the Quantity by the Price, always cutting off 3 Figures, or Cyphers, towards the Right Hand.

Example. Bought 4796 plain Tiles, at 17*s* 6*d per M.*

17

6d is $\frac{1}{2}$ of 1*s* 81532
2398

83|930
12

4|3|11|160

Anf. *l.* 4-3-11 $\frac{160}{1000}$

This is an eafy and plain Method.

Again, Sold 45874 Grey Stock Bricks, at 18*s per M.*

18

82|5,732
12

---

l. 41-5-8 |784
4

3,136

Anf. *l.* 41-5-8 $\frac{3}{4}$ $\frac{136}{1000}$

I multiply by 18, and it produces 825*s* and 732 cut off for 1000, and that multiplied by 12, gives 8*d*, &c.

A

A Fraction is seldom abbreviated in Decimals.

XIV. *Valuation.* The Value of a Fraction is found by multiplying the *Integer* by the *Numerator* of the Fraction, and dividing that Product by the *Denominator*. Or contrarywise, by dividing by the *Denominator*, and multiplying by the *Numerator*.

Example. What is the $\frac{2}{3}$ of a *l. Sterling*?

Contra. 3)20 | 20*s.* the Integer.
 | 2 Numerator.
6 8 | 3)40
2 |
s. 13 4 Answ. | *s.* 13 4 Answ.

What is the $\frac{4}{5}$ of a *Pound*?

20*s.*
4
5)80
16 Answer.

What is $\frac{12}{28}$ of 20 *s.*
$\frac{3}{7}$ its lowest Terms.
7)60
s. 8 $\frac{4}{7}$ Answer.

What is $\frac{3}{7}$ of C. Weight?

Contra 7)112 | 112 lb. the Integer,
16 | 3
3 | 7)336
48 lb. Ans. | 48 lb. Answer.

What

What is	$\frac{6}{7}$ of a *l*?	*Answer,* 17*s* 1*d* $\frac{1}{2}$ $\frac{6}{7}$
	$\frac{7}{8}$ of a Shilling?	Ans. 10*d* $\frac{1}{2}$
	$\frac{6}{8}$ of *l* 100 *Sterl.*	Ans. 75*l*
	$\frac{7}{10}$ of a Tun of Wine?	Ans. 176 $\frac{4}{10}$ Gal.
	$\frac{7}{11}$ of a C. Weight?	Ans. 71 $\frac{3}{11}$
	$\frac{4}{10}$ of a Gallon?	Ans. 3 $\frac{2}{10}$ Pints
	$\frac{12}{16}$ of a Tun Weight?	Ans. 15 C
	$\frac{2}{3}$ of a Foot?	Ans. 8 Inches
	$\frac{3}{4}$ of a ℔ Wt?	Ans. 12 *oz.*

Mix'd Numbers.

What is $\frac{4}{6}$ of 12*s* 6*d*

```
        4
  -------
  6)50  0
  -------
     8  4
  -------
```

Contra.

```
6)12s 6d
--------
   2   1
       4
--------
   8   4
--------
```

If a Yard of Cloth be worth 8*s* 10*d* what $\frac{3}{4}$?

```
          3
    -------
    4)26  6
    -------
      6  7 ½ Ans.
    -------
```

If a ship be worth *l* 946 12 6, what $\frac{4}{32}$ Parts?

```
                4
  ---------------
  8)3786  10  0
  ---------------
   4)473  06  3
  ---------------
   l 118  06  6 ¾ Answ.
  ---------------
```

XV. If you would know what part of a Pound any Number of Shillings and Pence is, or what Part of a Tun any

any Quantity of *C. qrs.* and *lb.* is, bring them into the lowest Name mentioned; and also bring the Integer into the same Name, and set it for a Denominator; and then bring the Fraction into its lowest Terms.

Example. What Part of a Pound is 12*s* 6*d*?

20*s* the Integer	12
12	
240	Numerator, 15|0 | 5 } Answer.
	Denominator, 24|0 | 8 }

When there are Cyphers in a Vulgar Fraction at the End, they may be cut off, and you work as if there were none; as in the foregoing Example.

What Part of C. Wt. is 71 lb. $\frac{3}{11}$?

11	112 lb the Integer
784	11
1232	1232

Answer $\frac{784}{1232}$, or $\frac{7}{11}$, in its lowest Terms.

XVI. *To reduce Vulgar Fractions into Decimals.* Reduction of Decimals is either from common Fractions, or into some known Denomination. Therefore to reduce any Vulgar Fraction into a Decimal, to the Numerator of the Fraction, annex 1, 2, 3, 4, 5, or more Cyphers at pleasure, and then divide by the Denominator.

Example. Reduce $\frac{3}{4}$ of a *l* into a Decimal Fraction.

4)300

,75 *Facit*, or 15 *s.*

Here, to the Numerator 3, I annex two Cyphers, and divide by the Denominator, and it quotes ,75; which is equal in Value to $\frac{3}{4}$ of any thing.

If I had annexed 3 Cyphers to the Numerator, the Quotient would then have been ,750, which is still but ,75; for Cyphers on the Right Hand do not increase or diminish a Decimal, as was said before? Again,

Reduce $\frac{2}{3}$ of a *l.* into a Decimal.

3)2000

,666 *facit*, or 13 *s.* 4 *d.*

Reduce 6 *s.* 8 *d.* into a Decimal.

12

8|0|2

24|0|6

6)2000

,333 *facit*, or 6*s* 8*d*

XVII. *Valuation of Decimals.* In Money you must account for every *Prime*, or *Unit*, in the first Place, 2 Shillings; and for every 5 in the second Place, 1 Shilling; and what is above 5, account so many Tens; and the Figure in the third Place, so many Units; which Tens and Units are Farthings; but if they exceed $\frac{25}{48}$, there must be one Farthing abated.

Example. What is the Value of ,73 *l.* the first of the foregoing Examples? *Answ.* 15*s.* For the 7 in the first Place, I reckon 14*s.* and for 5 in the second, I account 1*s.* which put together, make 15*s.* the Value of the *Decimal Fraction.*

Again. Another *Example* is ,333: For the first 3 I reckon 6*s.* and for the other two I account 33 Farthings, and abating 1, (because above 25) there rests 32, or 8*d.*

What is the Value of ,9749? The first Figure 9, being doubled, makes 18 *s.* and the Figure (7) in the second being above 5, I reckon 1*s.* which put to the 18, makes 19*s.* and the Excess of 7 above 5 being 2, or 2 Tens, makes the next Figure 4 to be 24, which is 24 Farthings, or six Pence. So the Decimal Fraction ,9749 is in Value 19*s.* 6*d.* *A decisive Rule.* As often above 13 make less by 1, or above 39 make less by 2.

When you would know the Value of a Decimal in Weight, Measure, &c. (as the Value of Decimals of Money may be found) multiply the Decimal by the Parts of the next inferior Denomination, which make an Integer

ger in the ſame Denomination with the given Decimal; and cut off ſo many Figures towards the Left Hand, as there are places in the Decimal, and the Figures on the other Side of the Stroke towards the Left Hand, are the Value of the Decimal, in the next inferior Denomination: And if there be any thing remaining, multiply it by the parts of the next lower Denomination, &c. And ſo the Fraction may be reduced as low as you pleaſe.

Example. What is the Value of this Decimal of a C. Weight, *viz.* ,875 Anſwer $\frac{3}{4}$ 14 lb.

4 *qrs.* 1 C.

———

3|500
28 lb. 1 *qr.*

———

4000
1000

———

14|000

Here three Places are cut off towards the Left Hand, becauſe there are ſo many in the Decimal. And thus may the Value of any Decimal be found, whether of Money, Weight, Meaſure, Time, &c.

XIX. To reduce compound Fractions into ſimple ones of the ſame Value.

Rule. Multiply all the Numerators continually for a Numerator, and all the Denominators for a Denominator.

Ex. Reduce $\frac{3}{4}$ of $\frac{5}{6}$ of $\frac{7}{8}$ of a *l.* into a ſimple Fraction.

3	4
5	6
—	—
15	24
7	8
—	—
Numerator 105	192 Denominator.

Denominat. 192 *Facit*

Reduce $\frac{9}{10}$ of $\frac{11}{12}$ of $\frac{13}{14}$ of a Tun $\frac{1287}{1680}$.

XX.

XX. To reduce whole or mix'd Numbers into improper Fractions. *Rule.*

(1) If a whole Number is to be reduced into an improper Fraction, set the propos'd whole Number for the Numerator, and an Unit, or 1, for the Denominator. Thus 8 Integers may be reduc'd to $\frac{8}{1}$; or else you may assign a Denominator to the Integer, and multiply it by the assign'd Denominator, and the Product will be the Numerator to the said Denominator.

Example. Admit 9 Integers are to be reduced into an improper Fraction whose Denominator shall be 5: Here I multiply 9 by 5, the propos'd Denominator, and the Product is 45, for a Numerator to the said Denominator 5; so is the improper Fraction $\frac{45}{5}$ equal to 9 Integers.

Reduce 24 into an improper Fraction, whose Denominator shall be 8.

$$\begin{array}{r} 24 \\ 8 \\ \hline 192 \end{array}$$

$$\left.\frac{192}{8}\right\} \text{ Facit.}$$

(2) If a mixt Number is to be reduced into an improper Fraction. *Rule.*

Multiply the whole Number by the Denominator of the Fraction, and take in the Numerator.

Ex. Reduce $12\frac{3}{4}$ Yards into an improper Fraction.

$$\begin{array}{r} 4 \\ \hline \end{array}$$

$$\left.\frac{51}{4}\right\} \text{ Facit, equal to } 12\tfrac{3}{4}$$

Again, Reduce *l.* $14\frac{7}{8}$, or *l.* 14-17-6 into in improper Fraction.

$$\begin{array}{r} 8 \\ \hline \end{array}$$

$$\left.\frac{119}{8}\right\}$$

XXI.

XXI. To reduce improper Fractions into whole or mixt Numbers. *Rule.*

Divide the *Numerator* by the *Denominator*, and if it be a mixt number, what was taken in will remain.

Example. Reduce $\frac{119}{8}$ (the foregoing Sum) into its equivalent mixt number.

$$\begin{array}{l} 8)119 \\ \hline 14\frac{7}{8} \end{array}$$

Anf. Or *l.* 14-17-6.

Here the Anfwer is 14 Integers, and $\frac{7}{8}$ of an Integer.

Reduce $\frac{51}{4}$ Yards into a mixt number.

$$\begin{array}{l} 4)51 \\ \hline 12\frac{3}{4} \end{array}$$

Yards, *Anfwer.*

Reduce $\frac{45}{5}$ into its equivalent whole number.

$$\begin{array}{l} 5)45 \\ \hline 9 \end{array}$$

Anf. 9 Integ.

XXII. To reduce Fractions from one *Denomination* to another.

(1.) This is either a fmaller Fraction to be brought into the *Denomination* of a greater. Or,

(2.) A greater into that of a fmaller.

Example. Reduce 3*d.* $\frac{1}{2}$ into the Fraction of a *l. Ster.* Make of it a compound Fraction, thus. Reduce the mixt number into an improper Fraction, thus, 3*d* $\frac{1}{2}$, then fay, what is $\frac{7}{2}$ of $\frac{1}{12}$, of $\frac{1}{20}$, of a *l.*

Anf. $\frac{7}{480}$ $\frac{7}{2}$. Or you may fay, what is $\frac{7}{2}$ of $\frac{1}{240}$?

Anf. $\frac{7}{480}$.

Here it being reduced from a compound Fraction, to a fimple one, according to the 19th Rule of this Chapter, it produces $\frac{7}{480}$, the proper Fraction of a *l.* belonging to 3*d* $\frac{1}{2}$.

Reduce $\frac{3}{4}$ of a Penny to the proper Fraction of a *l.* Say $\frac{3}{4}$ of $\frac{1}{12}$ of $\frac{1}{20}$. Or $\frac{3}{4}$ of $\frac{1}{240}$. *Anf.* $\frac{3}{960}$.

By the same Method may be reduced either Weight or Measure, &c.

When the Fraction is to be brought from a greater to a lesser Name, then multiply the Numerator by the Parts in the several Denominations, betwixt that and it, that you would reduce it to.

As suppose the Reverse of the last Question was ask'd, *viz.*

What Part of a Penny is the $\frac{3}{960}$ of a *l.*

$$\begin{array}{r} 3 \\ 20 \\ \hline 60 \\ 12 \\ \hline 720 \\ 4 \\ \hline 2880 \end{array} \qquad \left.\frac{2880}{3}\right\} \text{Answ.} \qquad \begin{array}{r} 3)2880 \\ \hline 960 \end{array} \text{ Proof.}$$

Again, Reduce $\frac{3}{4}$ of a *l.* to the Fraction of a Penny.

$$\begin{array}{r} 3 \\ 20 \\ \hline 60 \\ 12 \\ \hline \end{array}$$

$$\left.\frac{720}{3}\right\} \textit{Facit.}$$

Addition of Fractions.

If the Fractions to be added have a common Denominator, then add all the Numerators together for a Numerator; and place it over the common Denominator.

Example. What is the Sum of $\frac{2}{5}$, $\frac{3}{5}$, and $\frac{4}{5}$ of a *l.*?

$$\begin{array}{r} 2 \\ 3 \\ 4 \\ \hline 9 \\ \hline 5 \end{array}$$

This being an improper Fraction, I reduce it to the mixt Number, and it makes 1 $\frac{4}{5}$, or *l.* 1-16.

Or thus:		Decimally.				Demonstration.		
$\frac{2}{5}$,4	$\frac{2}{5}$	,40	$\frac{2}{5}$	is		0	8	0
$\frac{3}{5}$,6	$\frac{3}{5}$	,60	$\frac{3}{5}$			0	12	0
$\frac{4}{5}$,8	$\frac{4}{5}$	,80	$\frac{4}{5}$			0	16	0
l. 1,8		1,80, or *l.* 1-16.			*l.*	1	16	0 *Proof.*

Here the Vulgar Fraction being reduced to Decimals, according to the 16th Rule of this Chapter, I cast up the respective Decimals, as I do whole Numbers, and the Answer is 1 Integer, and ,8 of an Integer; that is, *l.* 1-16, the 8 Primes being accounted 16*s.* according to the Rule of *Valuation of Decimals,* given in the 17th Rule of this Chapter.

In *Addition of Decimals,* we observe the same Method as in whole Numbers, only in setting down, regard must be had that the fractional Parts stand one under the other *viz.* Primes, (or Tenths) under Primes; Seconds under Seconds; Thirds under Thirds, &c. And if mixt Numbers are to be added, then the Fractions to stand as before directed, and the whole Numbers to stand as in whole Numbers; that is, Units under Units; Tens under Tens, &c. without any regard to the Fractions annexed.

Examples.

Fractions		Mixt numbers.
,45	,4	124,97
,5	,574	7,065
,095	,0067	27,5
,225	,56	65,007
1,270	1,5407	224,542

Note, *That so many fractional Places that the greatest hath, among them Numbers that are added, so many Places must be pointed off from the Total, towards the Right Hand, for Decimal Parts; and the other Figures towards the Left Hand are whole Numbers, as in the foregoing Examples may be observ'd.*

Again, Add 4 Foot 3 Inches, 6 Foot 9 Inches, and 8 Foot 6 Inches together.

Feet	Pts.
4	, 25
6	, 75
8	, 50
19	, 50 Answ. 19 Foot $\frac{1}{2}$.

More Examples.

Integers	Parts
41	, 426
16	, 04
36	, 274
22	, 8
116	, 540

Decimal Parts of a *l.*		*l.*	*s.*	*d.*
,333	or		6	8
,25			5	0
,75			15	0
,033			0	0 $\frac{3}{4}$
,3			6	0
1,636		*l.* 1	12	8 $\frac{3}{4}$

SUB-

SUBTRACTION.

I. As in *Addition*, if the Fractions have unequal *Denominators*, they must be reduced to a common *Denominator* before *Subtraction* can be made. Then subtract one *Numerator* from the other, and place the Difference over the common *Denominator*.

From $\frac{7}{8}$ of a *l.* take $\frac{2}{3}$

Decimally.

,875
,666
―――
,209 Ans. 4s 2d

7	2	8
3	8	3
21	16	24
16		

$\frac{5}{24}$ Answ. 4s 2d

From $\frac{7}{8}$ take $\frac{3}{8}$. Ans. $\frac{4}{8}$ or $\frac{1}{2}$

Decimally.

,875
,375
―――
Answ. ,500

From $\frac{11}{16}$ *l.* take $\frac{1}{2}$

$\frac{16}{8}$ $\quad$ 11
$\quad$ 8
―――
$\frac{3}{16}$ *Ans.* or 3s 9d

Subtraction of Decimals is the same as in whole Numbers, observing to keep the same Order of placing the Numbers as directed in *Addition of Decimals*.

II. To subtract a Fraction from a whole number.

Rule. Subtract the Numerator of the Fraction from the Denominator, and the Remainder place over the given Denominator, for a Numerator; and take a Unit from

the whole Number for what you borrowed, and the Remainder place before the Fraction found; which mixt number shall be the Difference sought.

Example. Subtract $\frac{6}{8}$ from *l.* 25, *facit* 24 $\frac{2}{8}$.
Here 6 from 8 and there rests 2, which I put over the Denominator 8, thus, $\frac{2}{8}$; then 1 from 25, there rests 24, which I place before the Fraction $\frac{2}{8}$, thus 24 $\frac{2}{8}$; which is the Difference sought.

From 12 Ells take $\frac{5}{8}$, *facit* 11 $\frac{3}{8}$.
Decimally. From .6875 take .5 of a *l.*

.5000

.1875 Anſ. or 3*s* 9*d.*

Here the Vacancy is supplied with Cyphers, or they might have been omitted, and only supposed to have been there; and if at any time there should be a Vacancy in the upper number, it may be supplied with Cyphers; or, as abovesaid, accounted there.

Example. Subtract this Decimal of a *l.* *viz.* .75, from this whole Number, 25 *l.*

25.00
.75

24.25 or *l.* 24-5

Here the Defect (tho' not of Places, yet of Number) is supplied by annexing Cyphers to the whole Number; for otherwise you could not subtract .75 from 25.

III. To subtract a mixt number from a whole number.

Rule. From the Denominator of the Fraction subtract the Numerator, and set the Remainder of the Denominator, and then pay 1 to the whole number, and subtract it from the Integer, and the Remainder is the true Difference sought.

Example

Example. From 12*s* take 5 $\frac{3}{8}$

	5 $\frac{3}{8}$	*Decimally.*
		12 *s*. . . .
facit	6 $\frac{5}{8}$ or 6*s* 7*d* $\frac{1}{2}$	5 . . 375
		Answ. 6 . 625 or 6*s* 7*d* $\frac{1}{2}$

Again. From 24 Ells take 19 Ells $\frac{3}{5}$

Decimally.	19 $\frac{3}{5}$
24	
19.6	4 $\frac{2}{5}$ Ans.
4.4 Answ.	

From 16 *C.* take *C.* 13 $\frac{7}{16}$

	Decimally
13 $\frac{7}{16}$	16 . . . .
	13.4375
2 $\frac{9}{16}$ Answer.	2.5625

IV To subtract a mixt Number from a mixt Number:

Rule. (1.) Take the lesser Numerator from the greater.

Example. From 37 $\frac{7}{8}$ take 23 $\frac{5}{8}$.

Decimally	23 $\frac{5}{8}$
37 . 875	
23 . 625	14 $\frac{2}{8}$ Ans.
14 . 250	

(2.) When a greater Fraction is to be taken from a lesser, then take the Numerator of the greater Fraction from its Denominator, and put the Remainder to the Numerator of the lesser, which is borrowing an Integer, &c.

Example. Take *C.* 24 $\frac{12}{16}$ from 35 $\frac{7}{16}$

C. 35 $\frac{7}{16}$
24 $\frac{12}{16}$
Facit, 10 $\frac{4}{16}$

From *Gal.* 78 $\frac{3}{4}$ take *Gal.* 27 $\frac{2}{3}$. Reduced to a common *Denominator.*

The Fractions $\frac{9}{12}$ and $\frac{8}{12}$, then from 78 $\frac{9}{12}$

take 29 $\frac{8}{12}$

Facit 49 $\frac{1}{12}$

MULTIPLICATION.

Rule. I. First multiply the *Numerators* together for a Numerator; and secondly, multiply the *Denominators* together for a *Denominator.*

Example. Multiply *l* $\frac{7}{8}$ by $\frac{3}{4}$ of a *l.*

$$\left.\begin{array}{l}\text{Here 7 times 3 is 21, the Numerator, } 21 \\ \qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad \text{——} \\ \text{And 8 times 4 is 32, the Denominator } 32\end{array}\right\} \begin{array}{c}\textit{facit,} \\ \text{or} \\ 13\text{-}1\ \frac{1}{2}\end{array}$$

Multiplication in whole Numbers increases the Product, but in Fractions it decreases, that is, makes it less than either of the two Numbers alone.

The Reason is, Because 1 multiplied by 1, is but 1; therefore that which is less than 1, being multiplied by that which is less than 1, must needs be lessened by *Multiplication.*

In *Multiplication of Decimals*, we proceed as in whole Numbers; only when you have done your Multiplication, you must point off from the Product, as many Figures, or Cyphers towards the Right Hand, as there are fractional Places in both Multiplicand and Multiplier; and what Figures remain towards the Left Hand, beside what are cut off, are Integers: but if there are not so many Places, such Defect must be supplied by Cyphers towards the Left Hand.

Example. Multiply the foregoing Sum, *viz.* $\frac{7}{8}$ by $\frac{3}{4}$, decimally.

Here

$\frac{7}{8}$,875
$\frac{3}{4}$,75

4375
6125

,65625 *Answ.* 13*s* 1*d.*

Here are 5 decimal Places in both the Fractions, therefore all the Product is pointed off for decimal Parts.

II. When a compound Fraction is to be multiplied by a simple one, then reduce the compound Fraction into a simple one, according to the 19th Rule in *Reduction of Fractions*, and work as before.

Example. Multiply $\frac{3}{5}$ of a *l.* by $\frac{7}{8}$ of $\frac{5}{4}$ of a *l.* The compound Fraction being reduced, makes $\frac{25}{128}$, which multiply by $\frac{3}{5}$, produces $\frac{45}{256}$, or 3*s* 6*d.*

When a Fraction, or mixt Number, is to be multiply'd by a whole Number, constitute a Unit for a Denominator to the whole Number, and then it becomes an improper Fraction; then work as before.

Example. Multiply 24 by $\frac{2}{3}$. $\frac{24}{1}$ *facit* $\frac{48}{3}$.
Multiply *l.* 12 by $\frac{3}{8}$ of a *l.*
$\frac{12}{1}$ *p.* $\frac{3}{8}$. *Answ.* $\frac{36}{8}$ or 4 *l.* 10 *s.*
Decimally

,375
12

Facit, 4,500 or 4 *l.* 10 *s.*

III. When a mixt number is to be multiplied by a Fraction, reduce the mixt Number into an improper Fraction, and work as before.

Example. $16\frac{1}{2}$ by $\frac{4}{12}$
2

33

$\frac{33}{2}$ *p.* $\frac{4}{12}$, *facit* $\frac{132}{24}$.

Multiply $7\frac{3}{4}$ by $\frac{3}{4}$ of a Yard, *facit* $\frac{93}{16}$, or $5\frac{13}{16}$ Yards.

Decimally.

```
 7.25
  .75
 ----
 3625
5075
------
5.4375
```

IV. To multiply mixt Numbers by mixt Numbers; that is, a whole Number and a Fraction by a whole Number and a Fraction.

Rule. Reduce the given Numbers into improper Fractions, and work as before.

Example. Multiply 120 $\frac{1}{4}$ by 48 $\frac{1}{2}$.

```
        4     2          4
       ---   ---         2
       481   481  97    ---
       ---    97 ---     8 Denom.
        4    ---  2     ---
            3367
           4329
           -----
Denominator, 8)46657
           -------
      Answ. 5832 1/8 Feet.
```

Or thus: First multiply the whole Numbers together; as 120 by 48; and to the Product add $\frac{1}{4}$ of 48, and $\frac{1}{2}$ of 120. *Example.*

Decimally.

```
120.25
  48.5
------
 60125
96200
48100
--------
5832.125 Answ.
```

```
120 1/4 long.
 48 1/2 broad.
 -----
  960
 480
   60 the 1/2 of 120
   12 the 1/4 of 48
 -----
 5832 1/8 Answ.
```

Then

Then multiply the Fractions by themselves, saying, once 1 is 1, and twice 4 is 8; which produces the $\frac{1}{8}$, as in the *Example.*

And thus, by either of these Ways, having the Length and Breadth of any superficial Quantity, its Content may be found.

Multiply 2*s.* $\frac{1}{3}$ by 3*s* $\frac{2}{4}$

	$3\frac{2}{4}$
	6
	1
	1
Facit,	$8\frac{2}{12}$, or 8*s* 2*d.*

Or thus (3)

2	4	
	3	6
7	0	
1	2	
8	2	

Or 2*s* 4*d* by 3*s* 6*d* (2)

Or thus:

	s.	*d.*
	2	4
	3	6
	6	0
	1	0
	1	2
Ans.	8	2

Decimally.

```
  2.333
    3.5
  -----
  11665
  6999
  ------
  8.1655
```

8.1655 *Answ.* 8*s.* 2*d*

The second of these Ways is called *Cross Multiplication*, or *Duo-decimals*, by which Shillings and Pence may be multiplied by Shillings and Pence; or Feet and Inches by Feet and Inches, carrying the same from one Denomination to the next; for as 12 pence make a Shilling, so does so many Inches a Foot. In the Work I first multiply the whole Numbers by themselves, saying 3 times 2 is 6; then cross-ways, I say, 6 times 2 is 12*d*, or 1*s*. and 3 times 4 is 12*d* or 1*s*. Then the pence by the pence, saying 6 times 4 is 24, which I divide by 12, saying, the 12's in 24, twice, &c.

But

But the third and best Way is wrought *practically*, and the last *decimally*; each Method producing the same Answer; as may be seen in each Work.

Multiply	*l.* 3	15	9	
By			*l.* 4,7,6	
	15	3	0	
2*s* 6*d* $\frac{1}{8}$		9	$5\frac{1}{2}$	
Ditto		9	$5\frac{1}{2}$	
Ditto		9	$5\frac{1}{2}$	
Facit	*l.* 16	11	$4\frac{1}{2}$	

l. 84	13	6	
		l. 17,3	
338	13	0	*p.* 4&4
		4	
1354	16	0	
84	13	6	
8	9	$4\frac{2}{10}$	
4	4	$8\frac{1}{10}$	
l. 1452	3	$6\frac{3}{10}$	

By the same Method may be multiplied Weight or Measure.

DIVISION.

I. If the Fractions are single, and have a common Denominator; divide one Numerator by the other, and place the Quotient over the Denominator.

Examples.

Divide $\frac{6}{8}$ by $\frac{3}{8}$, *facit* $\frac{2}{8}$

Divide $\frac{9}{12}$ by $\frac{3}{12}$, *facit* $\frac{3}{12}$

Divide $\frac{27}{32}$ by $\frac{3}{32}$, *facit* $\frac{9}{32}$.

II. *Division of Decimals*, is work'd just as it is in whole Numbers, only when the Work is over, you must point off as many Places from the Quotient, for Decimal Parts, as the Dividend has more than the Divisor; that is, there must be as many Decimal Places in the Divisor and Quotient, as there are in the Dividend; but if not, the

the Defect must be supplied by Cyphers being annex'd to the Left Hand of the Quotient, and is just the Converse of Multiplication of Decimals.

III. When the Divisor consists of more Places than the Dividend, a competent Number of Cyphers must be annex'd to the Dividend, before you can make Division.

Example. Let us divide the first Sum on the other Side *decimally*; when the Fractions are reduced to Decimals, they make ,75, to be divided by ,375, wherefore I join two Cyphers to the Dividend ,75, thus ,7500, and then divide as in whole Numbers.

,375),7500(,20 or ,2
750
―――
(0)

IV. When in Vulgar Fractions, the *Dividend* and *Divisor* are both simple Fractions, then multiply the Numerator of the *Dividend* by the *Denominator* of the *Divisor*, for a *Numerator*; and also multiply the *Denominator* of the *Dividend* into the *Numerator* of the *Divisor*, for a *Denominator*, and the Work is done.

Example.

What is the Quotient of $\frac{4}{5}$ of a *l.* divided by $\frac{3}{4}$ of a *l.*

$\frac{3}{4}$) $\frac{4}{5}$ ($\frac{16}{15}$ Answer.

Divide $\frac{12}{14}$ by $\frac{9}{12}$, *Facit* $\frac{144}{126}$, or $\frac{8}{7}$.

Or you may reduce the Fractions to a common *Denominator*, and then divide the new *Numerator* of the *Dividend* by the new *Numerator* of the *Divisor*.

Example

Example.

Divide $\frac{12}{14}$ by $\frac{9}{12}$, $\frac{144}{168}$, $\frac{126}{168}$.
126) 144 (1 $\frac{18}{126}$ *Answer.*

V. To divide a whole Number by a Fraction, multiply the Integer by the Denominator of the Fraction, and divide by the Numerator.

Example.

Divide 15 Yards by $\frac{3}{4}$ 3) $\frac{60}{20}$ *Answ.*

Decimally.
.75)15.00(.20 or .2
150.

(0)

VI. To divide a Fraction by a whole Number, let the Numerator stand as Numerator, and multiply the Integer into the Denominator for a Denominator.

Example.

Divide $\frac{2}{5}$ of an Ell by 9 Ells, *facit* $\frac{2}{45}$

Decimally.
9).400(

.044 *Answ.*

VII.

VII. To divide a mixt Number by a whole Number, reduce the mixt number into an improper Fraction, and by its Denominator multiply the Integer for a Divisor.

Example.

Divide 5 $\frac{3}{4}$ Yards by 4 Yards.

```
      4            4
    ----         ----
     23          16) 23 ( 1 7/16, Answ.
    ----         ----   16
      4                ----
          Decimally.     7
          4)5.750
          -------
          Facit. 1.437
          -------
```

VIII. To divide a mixt Number by a Fraction, reduce the mixt Number into an improper Fraction, and then multiply the Numerator of the improper Fraction, by the Denominator of the Fraction, and the Denominator of the improper Fraction by the Numerator.

Example.

Divide *l.* 12 $\frac{2}{3}$ by $\frac{5}{8}$

```
             3          38
           ----          8
            38          ---
 3         ----    15)304(20 4/15 Answ.
 5           3
---     Decimally.
15.  ⁄.  .25)12.666003(20.265 Answ.
```

IX. To divide a whole Number by a mixt Number, reduce the mixt and whole Numbers into improper Fractions, and work as before.

Example

Example.

Divide *l.* 48 by *l* 12 $\frac{1}{2}$

$$\frac{48}{1} \qquad \frac{25}{2}$$

48
2
25)96(3 $\frac{21}{25}$ Ans.
75
21

Decimally.

12,5)48,000(3,84 Answ.

X. To divide a mixt Number by a mixt Number bring them into proper Fractions, and work as before.

Example.

Divide 8 $\frac{3}{4}$ Yards by 5 $\frac{1}{2}$ Yards.

$$\frac{35}{4} \qquad \frac{11}{2}$$

44)70(1 $\frac{26}{44}$
44
26

Decimally.

5,5)8,750(1,59
55
325
275
500
495
(5)

The Rule of THREE.

Here, as in whole Numbers the first and third Numbers must be of one Denomination; and as is the Stating, so is the Operation the same, *viz.* second and third Numbers are multiplied together, and that Product divided by the first; according to the foregoing Rules of working Fractions.

Exam-

Example

If $\frac{3}{4}$ Yard of Cloth cost $\frac{4}{5}$ of a *l.* what $\frac{5}{6}$ Yard.

4	5
20	30

$\frac{3}{4}$) 30 ($\frac{8}{9}\frac{0}{0}$ Anſ. $\frac{8}{9}$ or 17*s* 9*d* $\frac{1}{4}$

When the Numerator and Denominator both terminate with a Cypher, or Cyphers, they may be cut off, and the Fraction ſtill retains the ſame Value.

There is another and better Way of working the Queſtion, when it is ſtated, which is thus.

Multiply the *Numerators* of the firſt, into the *Denominators* of the ſecond and third Fractions, for a new *Denominator*; and then the *Denominator* of the firſt Fraction into the *Numerators* of the ſecond and third, for a new *Numerator*; which, if an improper Fraction, may be reduced into a whole or mixt Number.

Example.

If $\frac{3}{4}$ Yard coſt $\frac{4}{5}$ *l.* what $\frac{5}{6}$ Yards *Anſ.* $\frac{8}{9}$ *l.*

4	3
16	15
5	6
80	90

Facit $\frac{8}{9}\frac{0}{0}$, as before.

The foregoing Queſtion wrought decimally.

Yards.

If ,75 *Yds* coſt ,8 *l.* what ,833
,8

,75),66640(,888 *Anſ.* or 17*s* 9*d*

If

	lb.	s.	lb.
If	$2\frac{3}{4}$ *Tobacco* cost	$3\frac{1}{4}$ what	$242\frac{1}{4}$?

$$\begin{array}{r} 2\ \tfrac{3}{4} \\ 4 \\ \hline 11 \\ \hline 4 \\ 7 \\ \hline 28 \\ 969 \\ \hline 252 \\ 168 \\ 252 \\ \hline 27132 \end{array} \quad \text{Numerator} \qquad \begin{array}{r} 3\ \tfrac{1}{4} \\ 2 \\ \hline 7 \\ \hline 2 \\ 11 \\ \hline 22 \\ 4 \\ \hline 88 \end{array} \quad \text{Denominator.} \qquad \begin{array}{r} 242\ \tfrac{1}{4} \\ 4 \\ \hline 969 \\ \hline 4 \end{array}$$

$$\left.\frac{27132}{88}\right\} \textit{Answ.}$$

$$88)27132(30|8$$

15 8 $3\frac{3}{4}$ *Farth.*

Decimally.

If 2.75 ——— 3.5 ——— 242.25
3.5

121125
72675

2.75)847.875(3018.3

Answ. *l.* 15 8 $3\frac{3}{4}$

Here the Operation is just as it is in whole Numbers.

Before

Before I conclude, I ſhall work ſome Examples in Intereſt by Decimals, by which may be ſeen, that the Decimal Way, in ſome Caſes, has the Advantage of the Vulgar.

Simple Intereſt.

Example 1. What is the Amount of a Year's Intereſt of 826 *l.* 13 *s.* 9*d.* at 5 *per Cent.*?

826,687
,05

Anſwer, 41,33435 Or, *l.* 41 6 8 $\frac{1}{4}$ according to the Rule of valuing a Decimal in Reduction of Fractions.

Here the 13*s.* 9*d.* is reduced to the Decimal ,687, and annexed to the whole Number, 826 *l.* with the Decimal Characteriſtick between them; which multiplied by ,05 the Decimal of the Rate, *viz.* 5 *per cent.* which is found by annexing Cyphers to the Rate, and dividing by 100, thus,

per Cent.
100)5000(,05 according to the way of valuing the Quotient in Diviſion of Decimals, *viz.* the Quotient muſt have as many Decimal Places as the Dividend exceeds the Diviſor. After the ſame Manner the Decimal for 4 *per Cent.* is found to be ,04, and of 6, ,06, &c.

Example

Example.

What is the Year's Intereſt of 348 *l*, 13 *s.* 2*d.* at 6 *per Cent. per Annum* ?

l. 348,658
,06

20,91948 *Anſw.* *l.* 20 18 4$\frac{1}{2}$.

Here there are as many decimal Places ſeparated to the Right Hand, as there are decimal Places in both Multiplicand and Multiplier, according to the Rule of Multiplication in *Decimals* (as in the foregoing Example alſo) and the decimal Parts are found to be 18 *s.* 4*d* $\frac{1}{2}$, according to the Rule of valuing a *Decimal* of Money, &c.

Example 3.

What's the Year's Intereſt of

l. 326,——at—— 4 *per Cent* ?
,04

13,04 *Anſw.* *l.* 13 00 9$\frac{1}{2}$

When the Simple Intereſt of any Sum is required for 2, 3, 4, 5 Years, &c. its only to find the Intereſt for 1 Year, and then to mulsiply that Intereſt by 2, 3, 4, or 5, &c.

J. N 4858019
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Example

Example 4.

What's the Intereſt of 324 *l.* 10 *s.* for 4 Years, at 4 *per Cent. per Annum*?

l.
32,45
,04

12,980 *Anſw.* for 1 Year *l.* 12 19 7 $\frac{1}{4}$
Years 4

Anſw. *l.* 51 18 5

If the Intereſt required be for Parts of a Year, *i. e.* Months, &c. take ſuch Parts of the Year's Intereſt, as 6 Months is the $\frac{1}{2}$, 3 Months the $\frac{1}{4}$, and 4 Months the $\frac{1}{3}$, &c.

To find the Intereſt of any Sum of Money, for any Number of Days, at any Rate of Intereſt.

Rule. Multiply the Principal by the Rate of Intereſt, and then that Product by the number of Days, which reſerve for a Dividend (which divided by 365,00 the common Diviſor for all Rates, is the days of the Year multiplied by 100) anſwers the Queſtion.

Example.

What's the Intereſt of 240 *l.* for 96 days at 5 *per Ct. per Annum*?
5

1200
96

365,00)1152,00 *Anſ.* *l.* 3 3 1 $\frac{1}{4}$

Likewiſe

Likewise there may be found Decimal Numbers correspondent to the Duty or Custom on Tobacco, and *Holland* Cloth, *viz.*

	240 ℔.
1*d* per ℔	,1 l.
5 *per Cent, off*	,05
Old Subsidy	,95
2 $\frac{1}{2}$ *per Cent. off*	,02375
New Subsidy	,92625
5 *per Cent more off the Old, viz.* 7 *d* $\frac{1}{2}$	,0475
Additional Duty	,87875
$\frac{1}{3}$ *of the New Subsidy with 4 per C. off*	,30875
	,01389375
	,29485625

Old Subsidy	,95
New Subsidy	,92625
Add.l. Duty	,87875
$\frac{1}{3}$ *New Subsi.*	,29485625
Impost	2,484
Duty of 240 l.	5,53385625

3*d per* ℔.	3,
10 *per ct. off*	,3
	2,7
8 *per ct. off*	,216
Impost	2,484

330 Grains an ounce of some kind for other

And so for *Holland* Cloth.

So some of the Rules of Practice may be work'd by Decimals, but shorter by Vulgar Fractions.

F I N I S.